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PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 11 FEBRUARY 1983 NO. 1

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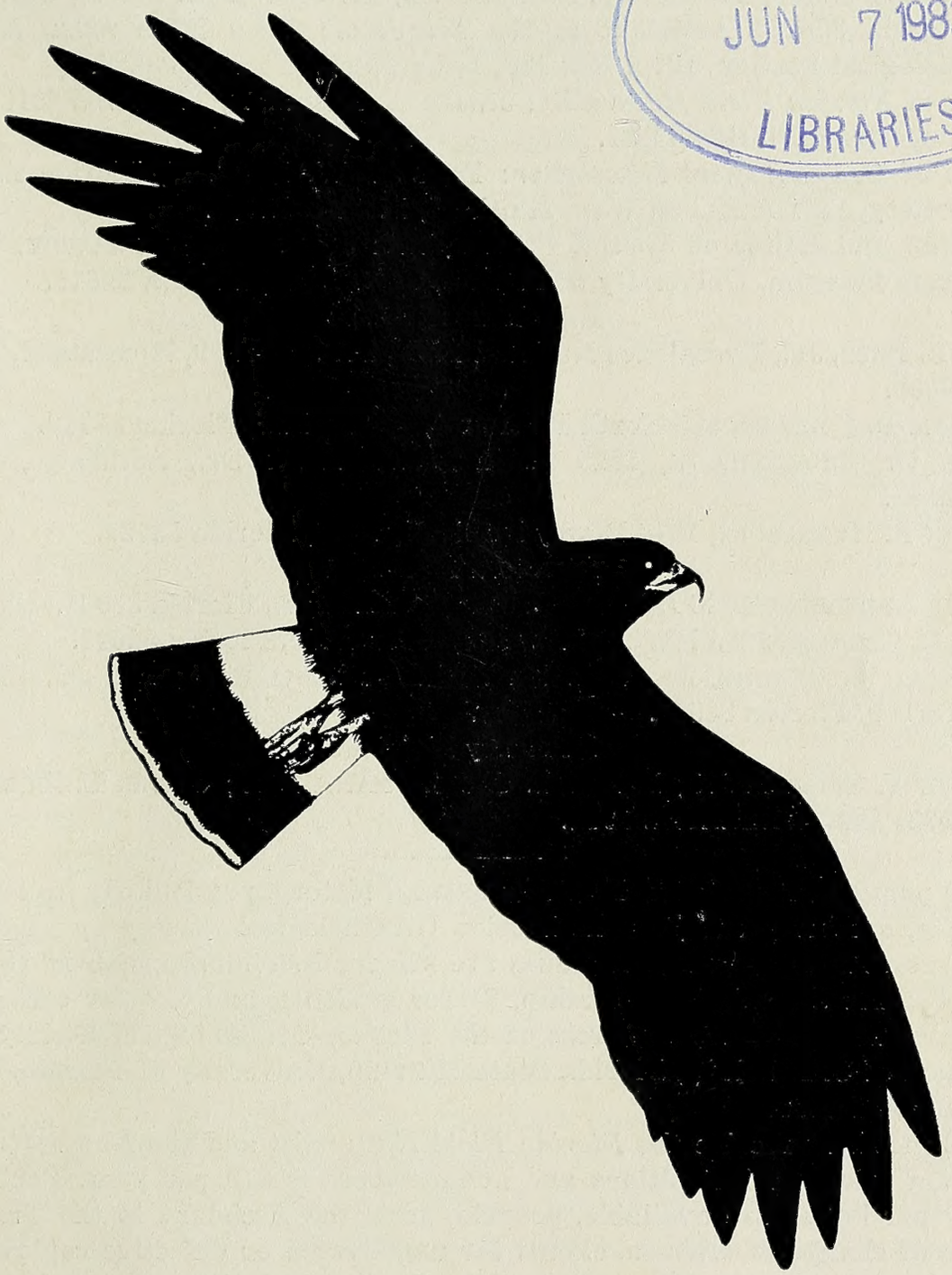

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FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 11, NO. 1 FEBRUARY 1983 PAGES 1-24

CROCODILIANS AND ISLANDS: STATUS OF THE AMERICAN ALLIGATOR AND THE AMERICAN CROCODILE IN THE LOWER FLORIDA KEYS

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Crocodilian populations located in geographically or ecologically marginal habitats are of special interest from a biogeographic perspective and also with respect to their conservation. Worldwide, crocodilian species are threatened with extinction, and in the United States hunting had decimated most populations by the 1940's (Allen and Neill 1949). With protection, many populations of the American alligator *(Alligator mississippiensis)* have recovered rapidly, and recent research in some states has been directed toward developing a program of sustained harvest (Nichols et al. 1976). The status of the apparently less resilient American crocodile *(Crocodylus acutus)* is more difficult to determine, and efforts for protection in the United States have focused primarily on ecosystem management (Kushlan 1982).

In the lower Florida Keys, crocodilians face an island environment removed from the nearest portion of their mainland ranges by an extensive open body of seawater. Three National Wildlife Refuges provide the opportunity for their conservation and management. In this study I examine the distribution and status of a small, apparently isolated population of alligators in the lower Florida Keys, Monroe County, Florida, and evaluate reports of crocodiles in the area.

Florida Field Naturalist 11: 1-16, 1983.

Methods

Field work was conducted from May, 1979, to November, 1981. During this period I searched for alligators and nests, charted fresh water areas, and monitored seasonal changes in salinity and water level on Big Pine Key. Selected habitats of all salinities representative of those available to alligators were surveyed quarterly from Fall 1979 to Summer 1980. I searched other areas of Big Pine Key and parts of Little Pine and Howe Keys less frequently.

I used salinity measurements, taken at each alligator sighting, to document the association of alligators with the range of salinities available in the lower keys. To document seasonal fluctuations in salinity, I also took measurements at least quarterly in five habitats: ditched areas (including some natural areas with ditches nearby); natural areas (including hammocks and buttonwood sloughs); man-made areas (including canals and borrow pits); mangrove flats; and marine areas (including open water and tidal canals). In compiling data on habitat use and salinity associations, alligators identified as individuals were tallied only once in the total count and for each salinity and each habitat type in which they were found.

An aerial survey in May 1979 covered Little Pine Key west to Sugarloaf Key including parts of Big Pine, Mayo, Annette, Howe, Water, Raccoon, and Cudjoe Keys. I searched for alligator nests in the summers of 1979 and 1980. Due to logistic and financial constraints, I did not undertake the extensive surveys of marine areas necessary to completely document crocodile occurrence. For this and for historic information I rely on previous surveys, published literature, unpublished references, and interviews with local citizens and crocodilian experts. Unfortunately, the history of crocodilian presence in the lower keys is poorly documented and is especially complicated because the two species are sometimes difficult for inexperienced observers to tell apart. Observations based on information from single witnesses are subject to uncertainty and should be interpreted with caution.

Study Area

The Florida Keys comprise a chain of islands stretching for over 240 km off the southern tip of Florida from Soldier Key southwest to Key West, bordered by the Atlantic Ocean, Florida Bay, and the Gulf of Mexico (Hoffmeister 1974). The upper and lower keys, distinguished by their geologic history and present vegetation (Duellman and Schwartz 1958), are separated by an 11-km span of open water, which provides a partial barrier to dispersal and interchange for many terrestrial vertebrates. A seawater gap of about 48 km separates the lower keys from mainland Florida (Dunson and Lazell 1982).

The lower keys are more varied in their vegetation than the upper keys, supporting at one time large areas of pineland and extensive hammocks (Small 1913). Most of the islands are surrounded by a thick growth of red mangroves *(Rhizophora mangle)*, which entirely covers many of the smaller, low-lying keys (Dickson 1955). Sandy beaches are rare and limited in extent (Hoffmeister 1974). Shallow intertidal flats surround most of the islands.

I studied the distribution of alligators primarily on Big Pine Key, the largest of the lower keys (2 400 ha) (Fig. 1). This island is 3.2 km wide and 12.9 km long and probably provides the greatest amont of fresh water habitat of any of the lower keys (Jacobson 1974, Hanson 1980). Although most of the land in the southern end of the island is privately owned, a large part of the island, particularly its northern end, is in the National Key Deer Wildlife Refuge.

Like the southern part of the mainland, all rocks of the keys are made of limestone. The lower keys are composed of oolite of the Miami limestone formation (Hoffmeister 1974), a porous rock which accounts for an important feature of the lower keys—the availability of fresh water. Hanson (1980) conducted a detailed study of the nature and extent of fresh water resources underlying Big Pine Key. Miami oolite extends from land surface to depths of about 4.0-7.0 meters at various parts of the island. Porosity of this formation is high, but the permeability is low due to the small interconnections between the voids. Fresh water storage occurs in both the oolite and the underlying Key Large limestone as a lens overlying denser seawater.

The areal and depth configurations of the lenses are influenced by five factors: fresh water recharge; fresh water discharge; tidal fluctuations; proximity to saltwater bodies; and permeability of subsurface materials. Rainfall is the only source of recharge, as the lower keys platform is not continuous with the Biscayne aquifer, which underlies mainland southern Florida. Average rainfall is 100 cm, of which 75-85 percent falls from May to October.

The seasonal variation in the availability of surface fresh water is marked, as suggested by the highly seasonal rainfall pattern. Endemic vertebrates such as the key deer *(Odocoileus virginianus clavium)* depend on this resource and show behavioral or physiological adaptations to the spatially and temporally limited nature of its availability (Dickson 1955, Dunson 1981, Dunson and Lazell 1982). During extended droughts the fresh water lenses may totally dissipate, and the stressful lack of surface fresh water seasonally occurs as a natural phenomenon. However, the increased stress induced by pumping from residential and commercial wells is expected to show detrimental effects in the future, particularly in areas of Big Pine Key zoned for commercial development. This would result in an even further decrease in fresh water availability owing to salt water intrusion and would create an unnaturally stressful situation for wildlife in the lower keys.

Results

Historic Distribution of Alligators

Accounts of early explorers and naturalists in the Keys are notable for their lack of any reference to crocodilians (Fontenada 1575, Gifford 1934, Henshall 1884, Holder 1971, Munroe and Gilpin 1930, Romans 1775, Simpson 1920, Williams 1837). In the earliest written reference to alligators in the lower keys, Fowler (1906) reported that alligators occurred on Little Pine Key, although he did

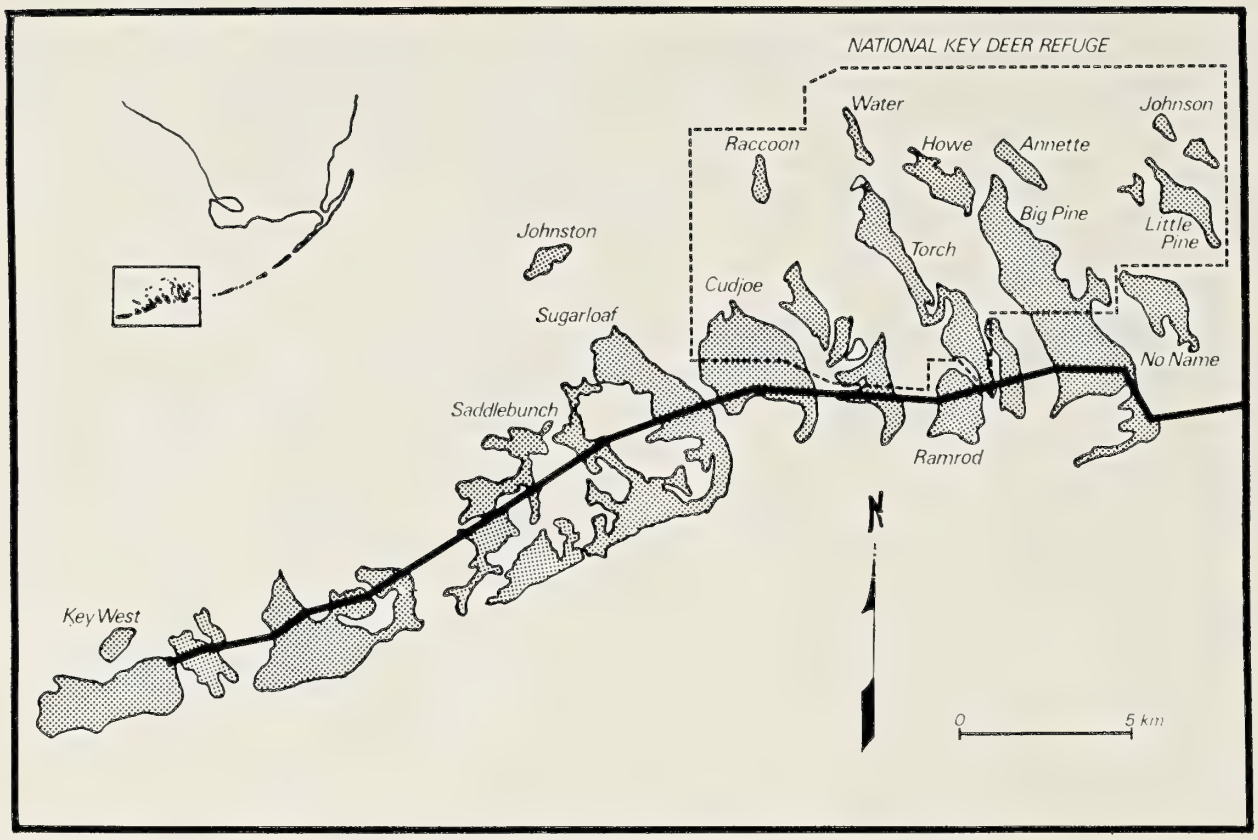

Fig. 1. Lower Florida Keys, showing boundaries of the National Key Deer Wildlife Refuge.

not personally observe them there. Two alligator skulls from Key West collected "prior to 1913" are in the National Museum of Natural History (Roy McDairmid pers. comm.). Small (1923) reported that in 1921 "some of the limesinks [in the hammocks on Big Pine Key] . . . were formerly frequented by alligators and crocodiles, but these animals have mostly disappeared. . . ." Two newspaper stories reported alligators on Big Pine Key "about 1920" (Parks 1975) and on No Name Key "sometime after 1919" (Parks 1969). In 1937, three alligators were collected "on Key West proper . . . in salt water" (Allen and Slatten 1945), and this account was later taken by Neill (1971) to indicate the presence of a permanent population.

Present Distribution of Alligators

Habitat Availability and Use.—Habitats available to alligators in the lower keys are spatially and temporally discontinuous. Spatially, the isolation of fresh water habitats by dry ground, roads, and development may be a partial barrier to movement. In May, 1979 however, a male alligator 3 meters long crossed 0.8 km of dry pineland (straight line distance) from one pond to another, indicating that such movement does occur. Temporally, the prolonged

dry season in the lower keys creates a rigorous environment for organisms dependent on restricted and fluctuating areas of fresh water (Dickson 1955, Dunson 1981, Lauren and Lance 1981).

I found most alligators in the lower keys in fresh and low-salinity brackish water (Fig. 2), although these data may be biased by less survey effort in open water areas. The scarcity and patchiness of natural fresh water habitats may contribute to a greater use of marine areas by alligators than would otherwise be expected. No evidence for seasonal movements is available, although the alligator's need for an aquatic environment on an island with restricted fresh water availability makes it reasonable to predict that alligators would leave the island for marine areas or other keys when inland water sources become dry or otherwise limiting.

Survey data and sightings from other sources show that alligators use all suitable habitat available (Fig. 3). Alligators occur in marine areas; in fact a majority of nuisance alligator complaints occur in man-made tidal canals in housing subdivisions (T. J. Reuther pers. comm.). Data on sightings in marine areas include 16 nuisance alligators relocated from such areas by the State Game and Fresh Water Fish Commission during 1977-1979. At least 34 relocations were reported; many of these alligators returned in a short time to the original capture site to become nuisances again. Other sightings in marine areas included four alligators observed in open water during a 1978 boat survey (Paul Moler pers. comm.). Night surveys in this study showed that mangrove flats bordering the island are used occasionally, although some of these areas dry seasonally, and salinities can reach 80 ppt.

The most frequently used natural areas are depressions near the edges of higher ground (hammocks and pinelands). These depressions are deeper than the prevailing water table and are generally associated with buttonwood trees *(Conocarpus erectus)* (Dunson 1981). The distribution and salinity of these holes during the dry season can be limiting to alligators when the extent of surface water depends entirely on rainfall. Alligators are known to maintain the size of ponds by their activities in swamp areas of the Everglades where the peat substrate is easily moved (Kushlan 1974). Such activity is rare in the lower keys, and I have seen evidence of the maintenance of ponds only twice, in the buttonwood sloughs of Big Pine and Little Pine Keys where the limestone is overlain by soft peaty deposits (Dickson 1955).

The alteration of natural areas has greatly increased the availability of fresh and brackish water habitat in the lower Florida

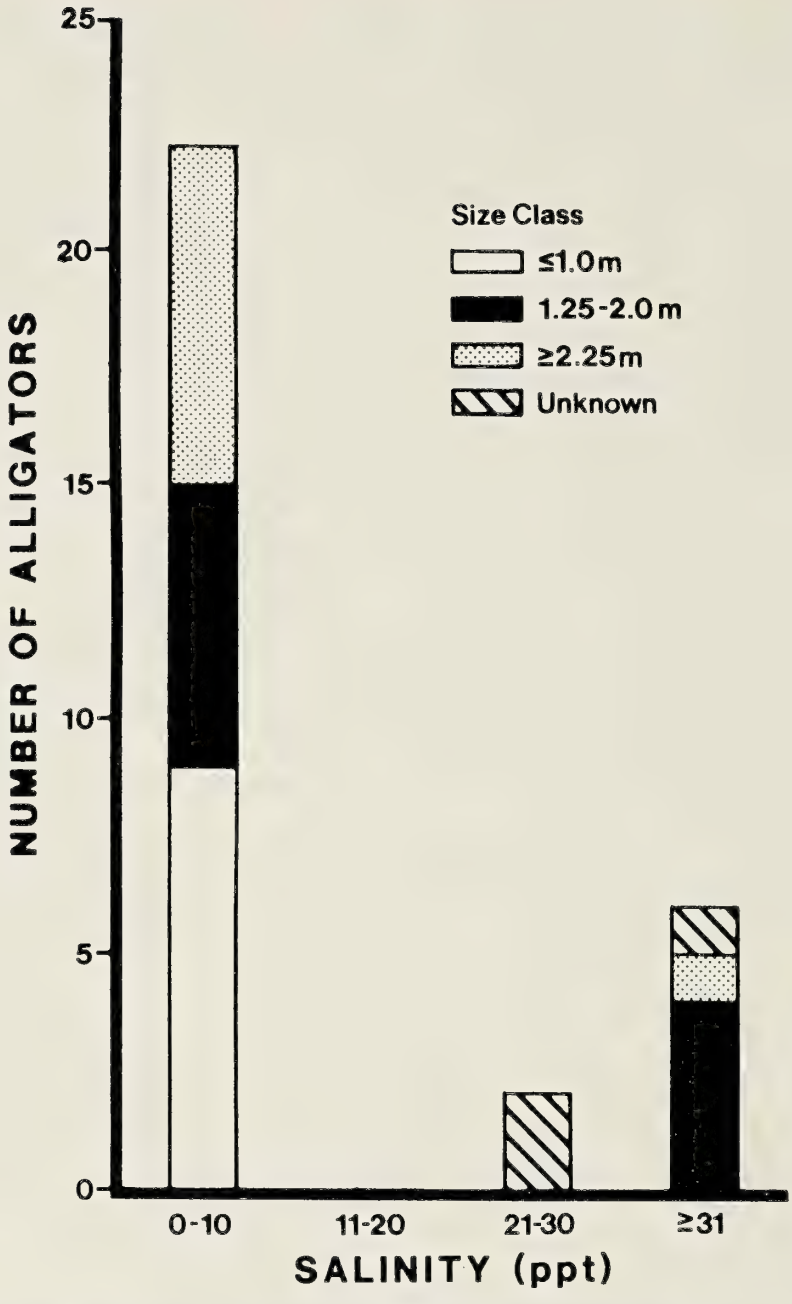

Fig. 2. Number and size classes of alligators observed in various salinities in the lower Florida Keys. Data used are those where salinities were measured at the time of observation.

Keys. On Big Pine Key, man-made inland canals, vestiges of abandoned development, and borrow pits used for fill for construction provided year-round deep-water habitats of low salinities. The severity of seasonal conditions is partially alleviated by a system of ditches, constructed in 1965 as part of the Anti-mosquito Control Program (Parks 1975). On Big Pine Key, over 160 unmapped kilometers of mosquito ditches, 40 cm wide and 120 cm deep (Silvy 1975), link natural depressions in 1 990 of the island's 2 440 hectares (Hardin 1974), creating a locally continuous aquatic system. These inland fresh water mosquito ditches are used frequently by small alligators, although I observed alligators of various sizes (.25-3.0 m total length) in ditched areas (Fig. 3).

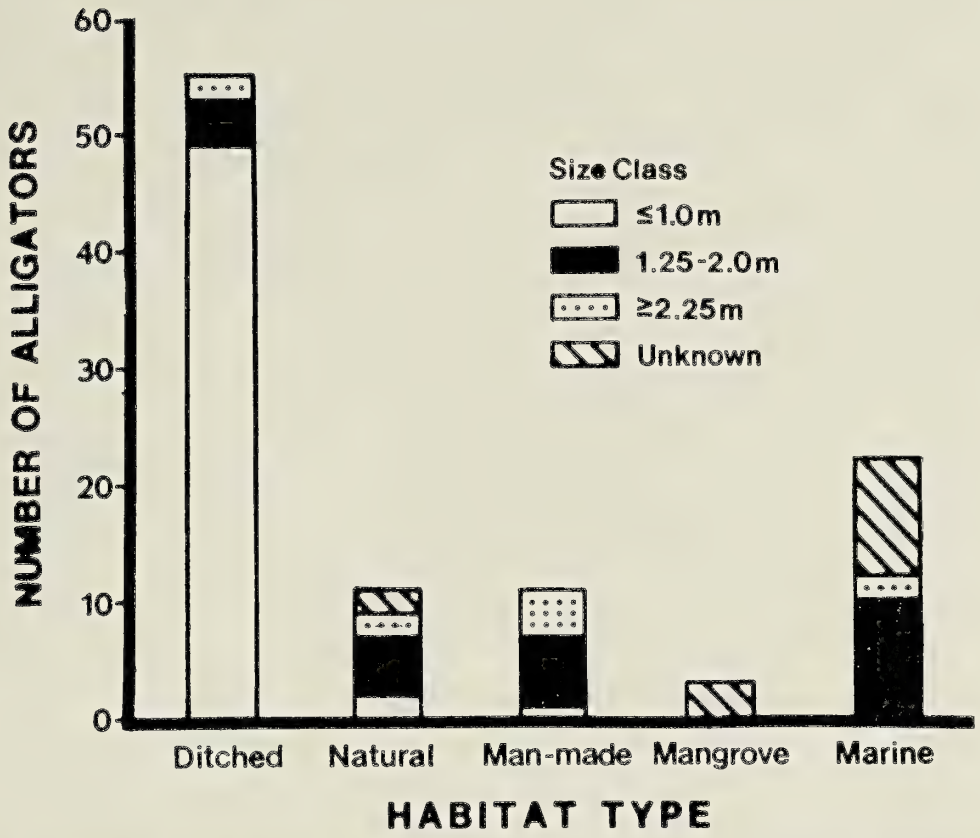

Fig. 3. Number and sizes of alligators observed in various habitats, in the lower Florida Keys.

The contrast in the seasonal availability of fresh water between natural and ditched areas is potentially important to alligator survival in the lower keys. Several natural ponds and most mosquito ditches retained water during the study period and apparently harbored alligators throughout the dry season. Most fresh water habitats on the island probably dry completely in more severe dry seasons. Under late dry season conditions, natural ponds appeared during this study to be extremely stressful because of their small size and high temperatures. Salinities never exceeded 10 ppt (Fig. 4) and so were probably not stressful. In natural areas, food availability was low to nonexistent, and it appears that prey levels are never high, because of the extreme seasonality of environmental conditions. Some mosquito ditches, however, retained water at cool temperatures and maintained a rich concentration of fish, invertebrates, and other aquatic vertebrates, which could restock areas flooded when water levels rise in the early summer. A sampling of prey items found in the ditches included prawns *(Palaemonetes paludosus)*, sailfin mollies *(Poecillia latipinna)*, mosquitofish *(Gambusia affinis)*, marsh killifish *(Fundulus confluentus)*, crayfish (*Procambarus alleni*), leopard frogs (*Rana sphenocephala*), and numerous unidentified aquatic insects. In other fresh and brackish

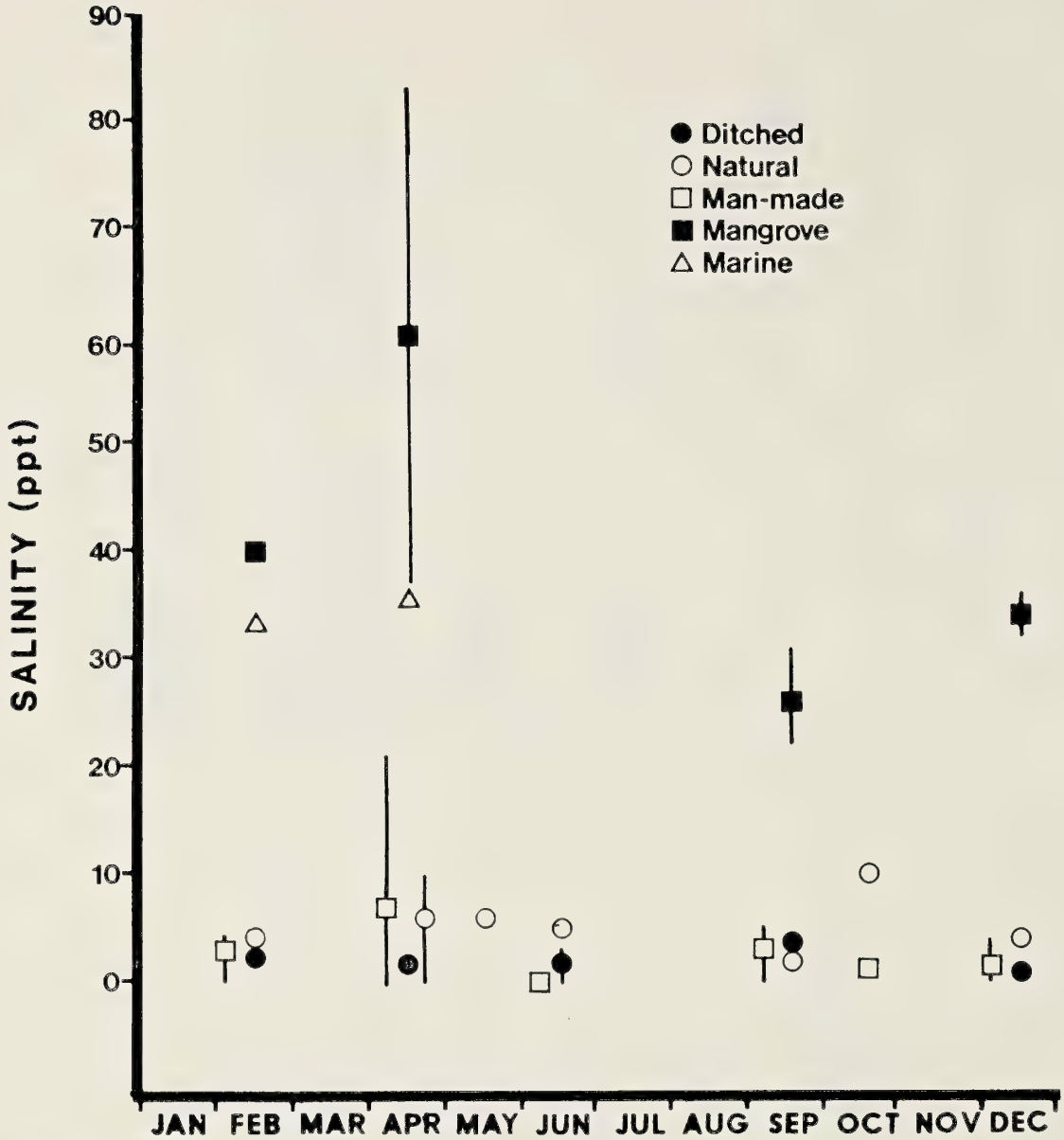

Fig. 4. Salinity measurements taken in various habitats, in the lower Florida Keys. Symbols show the mean reading and vertical lines show the ranges of measurements taken in each habitat for each month.

water habitats I found additional species, including bluegills *(Lepomis macrochirus)*, redear sunfish *(Lepomis microlophus)*, spotted sunfish *(Lepomis punctatus)*, sheepshead minnows *(Cyprinodon variegatus)*, goldspotted killifish *(Florichythys carpio)*, rainwater killifish *(Lucania parva)*, and the exotic Texas cichlid *(Cichlasoma cyanoguttatum)*, which appears to be replacing native species in the Blue Hole borrow pit lake on Big Pine Key. Observations during my study suggest that the high food availability, generally consistent temperature regimes, low salinities, and more permanent water provided by some mosquito ditches create an environment suitable for growth and survival of young alligators (Chabrek 1971).

Several other keys near Big Pine Key reportedly have small patches of standing fresh water (Dickson 1955), although only

Little Pine Key appears to support alligators in any numbers. Buttonwood sloughs occur on Little Pine Key on both sides of the small pineland ridge extending north and south on the key. At least one large, and probably permanent, pond was found at the southern end of the eastern slough, along with numerous fresh water ponds scattered along each slough. One pond showed signs of being actively maintained by alligators, but in all areas the availability of aquatic prey appeared extremely low. I observed three adult alligators in three separate ponds on Little Pine Key in November, 1981. Two small alligators (0.5 m total length) were subsequently observed in one of these ponds in February, 1982 (Steve Klett pers. comm.). On Howe Key, during the 1981 wet season, all holes were either dry, saline or extremely small, and no alligators were observed. Dunson (pers. comm.) reported no alligators in the numerous ponds on Johnston Key. Other holes on Johnson, Water and Annette Keys are monitored bi-monthly by Steve Klett, wildlife biologist at the Key Deer Refuge, who reported (pers. comm.) no alligator or crocodile sightings in these areas. W. D. Klimstra (pers. comm.) reported the sighting of a 1.5-2 m alligator on Johnson Key in 1965.

Numbers and Sizes.—During the study period 133 alligator sightings throughout the lower keys were compiled from survey data, personal observations, and reports which I judged to be reliable. Alligators of a wide range of sizes occur in the lower keys population (Fig. 5). Young alligators were sighted on Little Pine Key, which suggests that natural areas can support a reproducing population, although the scarcity of small size classes there suggests that survivorship to the second year in natural areas is quite low. The observation of 46 young, healthy alligators in ditched areas of Big Pine Key suggests that the overall survivorship in the lower keys may be enhanced by the mosquito ditches.

Reproductive Success.—I received three specific reports of nesting activity occurring prior to this study, in hammocks at the northern end of Big Pine Key (Nova Silvy pers. comm.), near the site of the old Big Pine Inn (William Robertson, Jr. pers. comm.), and near a canal south of Watson Hammock on Big Pine Key (T. J. Reuther pers. comm.). No nesting occurred in these areas in 1979 or 1980. I found two nests in 1979, and one of these sites had another nest in 1980. Both nest sites were on private property, and none of the three nests hatched successfully. However, the occurrence of

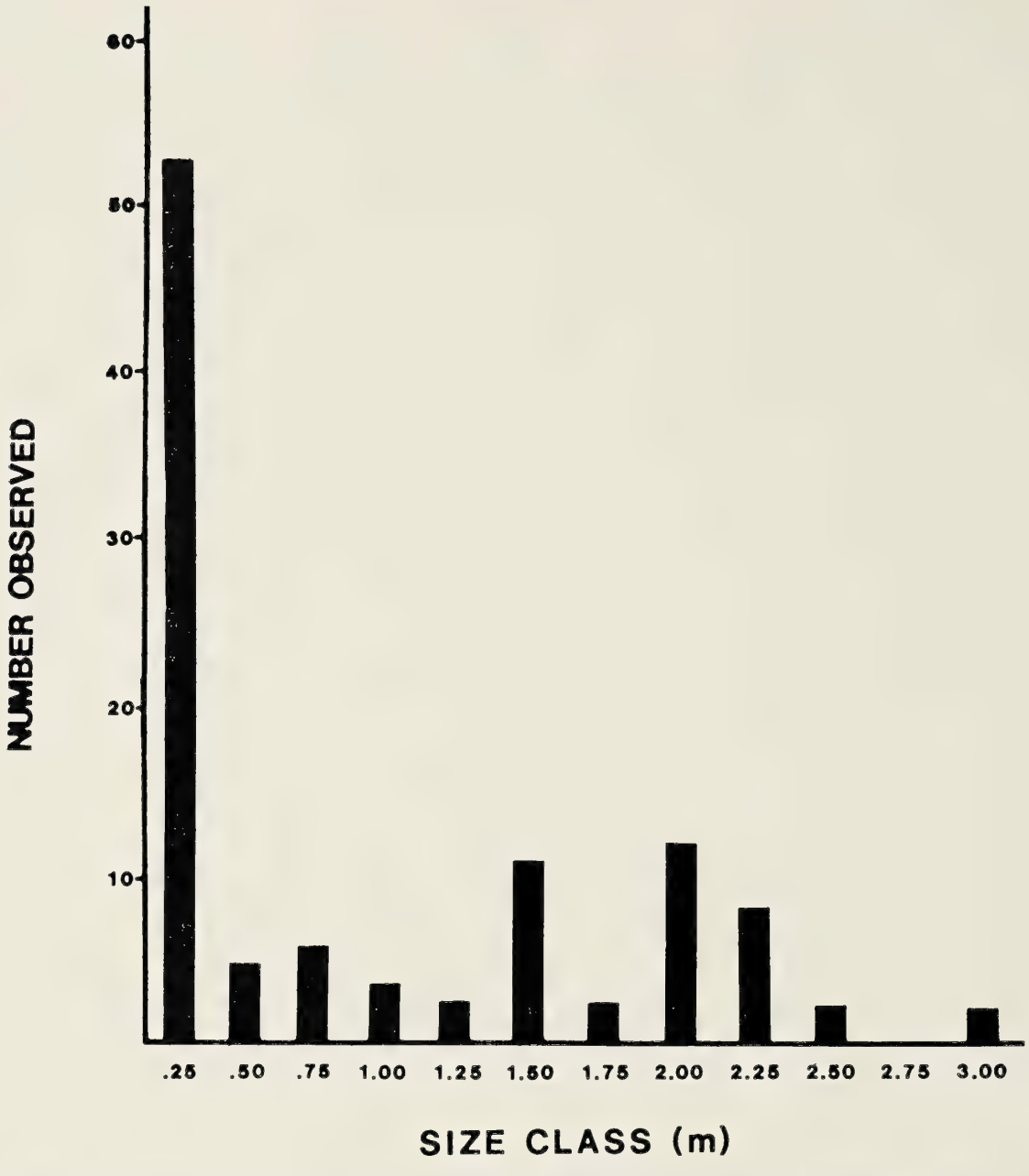

Fig. 5. Number of alligators observed throughout the lower Florida Keys in .25-meter size classes.

hatchlings (Fig. 5) demonstrated the existence of successful nesting in other locations.

Historic Distribution of Crocodiles

The earliest evidence of crocodiles in the lower keys is Neill's 1935 photograph of a crocodile on a beach in Key West (Neill 1971: 332). Previously, though, Allen and Neill (1949) reported the crocodile's range to include Key West "before 1925". Crocodile specimens collected in the late 1800's are available from the upper keys only, and crocodile eggs were taken in 1875 from the "Florida Keys" (exact location unknown) (Roy McDiarmid pers. comm.). At least

two early accounts include the Keys in the range of the crocodile, stating that they are "occasionally seen off Key West" (Carr 1940) and that they range as far south as Big Pine Key, where a specimen was reportedly collected in 1953 (Duellman and Schwartz 1958). Moore (1953), in an exhaustive review of the crocodile's status for Everglades National Park, does not report information from the lower keys, although he cited records from Florida Bay as far south as Plantation Key.

Ogden (1978) reported information from Jack Watson, former National Key Deer Refuge manager, that "small numbers of crocodiles were regularly reported during the late 60's and early 70's in the lower keys· . . ." Rather than representing members of a resident population, some of these individuals may have been displaced by hurricanes (Ogden 1978). Theatre of the Sea, an attraction in Islamorada, reported the loss of several crocodiles during the 1948 hurricane (Robert P. Allen, 1948, letter to Everglades National Park Superintendent, located at South Florida Research Center library, Homestead, Florida).

In the late 1960's (Parks 1970) or early 1970's (Ogden 1978), a crocodile nest was reported on Little Pine Key. It is possible that two crocodile nests occurred. Jack Watson (pers. comm.) saw hatchling crocodiles in a natural setting and also collected eggs from a nest opened by raccoons. These eggs were artificially hatched at the Key Deer Refuge headquarters (Jack Watson pers. comm., Parks 1970).

Present Status of Crocodiles

The abundance and reproductive status of crocodiles in the lower keys have always been unresolved issues. Hines et al. (1980) cited no evidence for the continued presence of crocodiles in the lower keys, although not refuting the possibility that a disjunct population may occur or may have occurred at some time. Four aerial and boat surveys conducted by Howard Campbell in 1978 and 1979 did not result in any crocodile sightings (1980, unpublished report on a summary of surveys conducted in the lower keys, located at the National Key Deer Refuge Headquarters, Big Pine Key, Florida).

The capture of a crocodile in a canal on Big Pine Key in May, 1979, after its release three weeks earlier in Barnes Sound on the upper Keys, indicates the feasibility of long distance travel by transient crocodiles. Other reports of crocodiles, although infrequent and unconfirmed, continue to occur. These may include alligators

misidentified as crocodiles. Including the capture and removal just mentioned, at least six crocodile sightings have been recorded in the last five years. Reported locations include Coupon Bight on Big Pine Key in 1976 or 1977 (T. J. Reuther pers. comm.), No Name Bridge in 1978 (T. J. Reuther pers. comm.), Missouri Key in 1979 (Barbara Bohnsack pers. comm.), and in a Big Pine Key canal in 1981 (Paul Moler pers. comm.). A crocodile was reportedly relocated in 1978 from the upper to the lower keys by the State Game and Fresh Water Fish Commission officer (T. J. Reuther pers. comm.), and it was later returned to the upper keys. I am unaware of any other reports of crocodiles being intentionally moved to the lower keys.

For a crocodile population to be self-sustaining, it must have suitable nesting habitat. A patch of such habitat can be found on Little Pine Key on the western side of the southern tip. This beach was monitored in 1978 and 1979 without showing any signs of crocodile nesting activity (Howard Campbell pers. comm.). During these periods, the area had been infiltrated with land crab burrows *(Cardisoma guanhumi)* and has since (1981) become overgrown with grass. Based on a ground search of the northwest shore, examination of aerial photographs and explorations by Refuge personnel, it appears that no other suitable habitat occurs on Little Pine Key. Other sandy beaches occur on the Content and Sawyer Keys and along some shorelines behind the mangrove fringe as on Sugarloaf and Ramrod Keys. These beaches are not extensive but include potential crocodile nesting habitat that is available in the lower keys.

Discussion

The Florida Keys lie within the range defined by three areas of crocodile concentration, the Greater Antilles, Central America, and northeast Florida Bay (Powell 1971, 1973, Schwartz and Thomas 1975, Wilson and Hahn 1973, Kushlan 1982). Furthermore, the proximity of crocodile and alligator populations to the north in Florida Bay suggests that crocodilians might disperse to the lower keys with little difficulty. Alternatively, the existence of a land bridge during the last part of the Pleistocene may have allowed the colonization of the lower keys, and, with the subsequent submergence of the Florida Bay area, populations on the lower keys that were once contiguous with the mainland may have become isolated (Auffenberg 1958, Duellman and Schwartz 1958, Neill 1957, Barbour and Humphrey 1982).

Recruitment in the alligator population of the lower keys appears to be occurring despite the apparently marginal nature of the island habitat. The fragile fresh water habitat of the lower keys is critical. Continued survival of alligators in an island environment surrounded by seawater is made possible in large part by the increase in fresh water habitat afforded by mosquito ditches, although the existence of areas removed from human activity may be important for nesting success. Dry season conditions can be severe, and low levels of prey availability might contribute to cannibalism or other forms of predation on young alligators, accounting for the paucity of these size classes in natural areas.

Considering the secretive nature of the crocodile and its probable low density in the lower keys (if it occurs there at all), the negative results of ground and aerial surveys for crocodiles are not unexpected. Crocodile sightings in the lower keys appear not to consist of residents but of transients or of individuals displaced by hurricanes. My observations in these areas suggest that some suitable crocodile nesting habitat is available in the lower keys, although it is limited in extent. The heavy public use of many open sandy beaches reduces the likelihood of crocodile nesting in the lower keys given the shy and easily disturbed nature of the species.

The historical evidence for the crocodile's occurrence and nesting in the lower keys is based on published and anecdotal testimony of a few individuals. No evidence exists that a population of crocodiles other than a few transient individuals existed in the lower keys at any time during at least the last two centuries.

Crocodilians have probably never been abundant in the lower keys because of seasonally stressful conditions, and the limited availability and patchiness of nesting areas and of habitat conducive to hatchling growth. The small alligator population in the lower keys has been preserved in part by the inclusion of fresh water habitat in the National Wildlife Refuge system. These conditions may be modified by management recommendations for the key deer that call for filling the ditches to reduce fawn mortality (Klimstra et al. 1980). A further threat is posed by the increasing commercial and residential demand on the already moderate fresh water supply underlying the lower keys. Evidence obtained during this study shows that mosquito ditches support alligators and that the preservation of mosquito ditches may be important to the future survival of the alligator population in the face of increasing loss, fragmentation, and deterioration of essential habitat.

Other management recommendations are suggested. Translocations of crocodilians from other areas to the lower keys should not be made, as such actions will disrupt the resident population. Exotic crocodilians should be removed from the lower keys to protect the native population and should be relocated to suitable zoos or attractions.

The lower keys provide a unique and fragile island habitat, which is being developed and otherwise modified at a rapid rate. From this viewpoint, the alligator population in the lower keys remains a threatened population according to the definitions of the Endangered Species Act of 1973, which calls for the threatened classification if a species "is likely to become endangered in the foreseeable future." Results of this study suggest that the lower Florida Keys should be considered a separate geographical unit in considering the statewide status of the alligator in Florida.

Summary

There is a small, isolated, reproducing population of alligators in the lower Florida Keys. The cover, food, and low salinity environment provided by fresh water mosquito ditches contribute to their continued survival. No self-sustaining population of crocodiles seems to exist in this area although occasional transient individuals occur. Data are not available to evaluate adequately historical trends in population status. The seasonally stressful environment and the limited availability of suitable nesting habitat suggest that alligators and crocodiles have not at any time occurred in substantially greater numbers than presently exist in the lower Florida Keys.

Acknowledgments

The need for crocodilian research in the lower Florida Keys had long been recognized and encouraged by the late H. Campbell, to whom I owe the impetus for this study. Valuable discussions with W. Dunson, J. Kushlan, P. Moler, J. Watson, L. Harris, F. Mazzotti, N. Deschu and others provided inspiration, encouragement, and editorial comments. I especially thank D. Kosin, S. Klett, J. Watson and various personnel of the National Key Deer Refuge, and T. J. Reuther of the Florida Game and Fresh Water Fish Commission for their cooperation and assistance with this study. W. Loftus identified fishes. The study was funded in part by a grant from Sigma XI and was supported in part by the National Park Service and the University of Florida.

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NOTES

Reevaluation of the sight record of Gray-breasted Martin in Florida.—We previously reported the sighting of a female-plumaged Gray-breasted Martin (*Progne chalybea*) on Big Pine Key, Monroe County, Florida in May 1977 (*in* Kale 1977, Amer. Birds 31: 988-992; Sykes et al. 1979, Fla. Field Nat. 7: 10). After this record was published, we examined a large series of museum skins of the genus *Progne* at the U. S. National Museum, particularly those of *P. chalybea* and of the Caribbean or Snowy-bellied Martin (*P. dominicensis*). We also reexamined the small series at the University of Miami, Coral Gables, Florida. We discovered in the reevaluation that our initial conclusion, based on examination of the small series at the University of Miami, was in error. We have now concluded that the martin in question was probably not *P. chalybea.*

The martin we saw on Big Pine Key had a sharp demarcation between its immaculate white belly and its dark breast, sides, and flanks. In *P. chalybea* there is a gradation of white to dark on the underparts. The sharp demarcation appears to be the best field mark for females of *P. dominicensis.* However, of the *P. chalybea* skins we examined, a small percentage has a sharp demarcation, which led to our misidentification. Field guides and other publications we examined either do not illustrate the female of *P. dominicensis* or show it incorrectly, and the text descriptions in all publications we have seen are inadequate when one has not had previous experience with the species in the field.

We now feel that the bird we saw may have been a *P. dominicensis,* but, under the circumstances and without a photograph or specimen, we can not report the identity of our sighting with certainity. The Caribbean Martin is found in western Mexico and in the West Indies from Jamaica east and south to Tobago (ffrench 1973, A guide to the birds of Trinidad and Tobago, Wynnewood, Pennsylvania, Livingston Publ. Co.). The species has been recorded in Bermuda but not in the United States.—**Paul W. Sykes, Jr.**, Mauna Loa Field Station, P.O. Box 44, Hawaii National Park, Hawaii 96718 and **Howard P. Langridge**, 1421 West Ocean Avenue, Lantana, Florida 33462.

Florida Field Naturalist 11: 17, 1983.

A record of the Black Vulture from Bimini, Bahamas.—On 4 March 1979, I found and photographed a freshly dead Black Vulture (*Coragyps atratus*) above the normal high tide line at the north tip of North Bimini, Bahamas. There was no external evidence suggesting cause of death. While Black Vultures are known from the adjacent mainland of southern Florida, they have not previously been reported from the Bahamas (Brudenell-Bruce 1975, The birds of the Bahamas, New York, Taplinger Publishing Co.; Vaurie 1953, Auk 70: 38-48; Mayr 1953, Auk 70: 499-501). Bond (1971, Birds of the West Indies, Boston, Houghton Mifflin Co.) noted that the species has been seen in Cuba and Jamaica but considered it to be a vagrant in the West Indies. A copy of the photograph is on file in the ornithological records of the Biological Sciences Department of Mississippi State University.—**Jerome A. Jackson**, Department of Biological Sciences, Mississippi State University, Box Z, Mississippi State, Mississippi 39762.

Florida Field Naturalist 11: 17, 1983.

Whirling and territorial behaviors of feeding Little Blue Herons.—On 18 February 1980 at 1214, I observed a Forster's Tern (*Sterna forsteri*) fishing about 90m from shore in a cul-de-sac on the east side of Old Tampa Bay, Hillsborough County, Florida. The tide was on the ebb and the tern made repeated successful dives into water approximately 15-20 cm deep. As the tern plunged for one dive, an adult Little Blue Heron (*Egretta caerulea*), which had been quietly stalking prey along the near shore, flew to the shallows and landed approximately 1.5 m from the tern. When the tern surfaced the heron opened its wings, ran two steps, and stabbed at the tern with its bill. The tern avoided the heron, flew into position for another dive, dove, and captured a prey item. With both wings flapping, the heron ran about 1 m toward the tern, stabbed directly at it, and struck the water as the tern avoided the attack. The tern flew about 30 m to an exposed sand bar while the heron remained in the shallow water. The heron slowly but unsuccessfully stalked in the shallows for about 6 min. before flying to the far shore where it resumed feeding.

After spending 3 or 4 min. walking slowly in water 10-15 cm deep, the heron opened both wings and began running back and forth, crisscrossing its path three times. It suddenly stopped and folded its wings, the open wing feeding described by Meyerriecks (1962). Within 2 min. this bird raised its left wing, whirled in a tight circle to the left, stopped with its wing upraised and peered into the water under its wing for about 5 sec. This behavior was similar to pirouetting as described by Meyerriecks (1962) for the Tricolored Heron (*Egretta tricolor*) but was performed at a faster tempo. The terminal portion of this activity resembled underwing feeding as described by Meyerriecks (1962) and Kushlan (1978a). The heron repeated the open wing feeding three times and whirling once within the next 15 min. The bird folded its wing at the end of each subsequent whirl. On one occasion the heron made a successful strike within 5 sec. after an open wing chase. It did not attempt to feed while running. Between bouts (which lasted 2-5 sec each) the heron used the slow walk and stand and wait techniques typical of this species.

I observed a second instance of whirling while feeding by a Little Blue Heron on the north side of the campground at Fort DeSoto Park, Pinellas County, Florida on 12 October 1981. Two Great Blue Herons (*Ardea herodias*), an adult and a juvenile, a Tricolored Heron, and one adult Little Blue Heron were foraging in shallow water along 1/2 km of beach as the tide ebbed at 1130. The Little Blue Heron and the juvenile Great Blue Heron were foraging actively in that they waded constantly and made three to five running dashes of 1/2 to 2 sec about every 10 min. In one instance the Little Blue Heron opened its right wing about 3/4 and ran 7 steps in a tight semicircle to its right. The heron stopped with its wing upraised and peered into the water in front of it for about 3 sec before slowly lowering its wing. It did not capture prey as a result of this activity.

Kushlan (1978a) noted that wading birds, including the Little Blue Heron, defend feeding areas both from members of their own and other species of all sizes of birds. The winners of territorial defense were always larger or the same size as the losers. In accounts of territorial and robbing encounters between members of different speices, the approach of an individual of a larger or dangerous species usually was sufficient to displace the smaller individual (Kushlan 1978a, 1978b, Mock and Mock 1980). Sometimes a smaller individual resisted displacement by fighting with the threatening individual (Mock and

Mock 1980). The interaction between the Little Blue Heron and Forster's Tern I saw did not follow either of these methods; rather the larger heron made a determined effort to displace the smaller tern, which initially ignored the heron.

Meyerriecks (1962), Kushlan (1976, 1978b), and Willard (1977) described the foraging behavior of the Little Blue Heron as primarily of the slow walking or stand and wait type. In his summary table Meyerriecks (1960) indicated that the Little Blue Heron displays open wing feeding. Willard (1977) mentioned that the Little Blue Heron only infrequently displays "active pursuit" and stated that the Louisiana Heron was the only species he saw whirling while feeding, although both it and the Snowy Egret (*Egretta thula*) made open wing dashes similar to those described here. It would seem that the observations I report are the first mention of whirling while feeding by the Little Blue Heron.

I wish to thank Dr. Andrew J. Meyerriecks and Dr. James A. Kushlan for reading earlier versions of this paper and offering suggestions for its improvement.

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Florida Field Naturalist 11: 18-19, 1983.

Solitary nesting by the Great Blue Heron in central Florida.—The Great Blue Heron (*Ardea herodias*) usually nests in colonies with other species of herons (Ogden 1978, Pp. 137-154 *in* Wading birds. National Audubon Society Research Report 7. New York, National Audubon Society; Palmer 1962, Handbook of North American birds, New Haven, Connecticut, Yale Univ. Press; Bent 1926, Life histories of North American marsh birds, U. S. Natl. Mus. Bull. 135). In Florida, Meyerricks (1960, Comparative breeding behavior of four species of North American herons, Publ. Nuttall Ornithol. Club 2) reported that mainland birds may nest singly, but I found no detailed description of a solitary nest of Great Blue Herons in the literature.

In this note I report a case of solitary nesting by a pair of Great Blue Herons in central Florida. The nest, discovered by Walter M. and Ruth D. Boone in mid-February 1982, was 12 m high in a dead and weathered pine (*Pinus* sp.). The tree was near the center of the Placid Lakes Golf Course approximately 4.5 km SW of Lake Placid, Highlands County, Florida. Canals through the area provide drainage and a man-modified riparian habitat. The nest tree was at the edge of such a canal. I watched the nest on six visits for 3 hrs 5 min between 1530 and 1710 from 24 March to 28 April 1982.

On my first visit, 24 March, the nest contained two white, downy chicks. When I returned two days later, an adult was shading the young. The siblings touched bills frequently and constantly vocalized while alternately begging and holding their bill upward. On 5 April the two feathered nestlings huddled in the nest, except to stretch and gape twice. On my 14 April visit, the young stood with the sun at their backs and gular fluttered. On 19 April one nestling wing-flapped and then settled into the nest. The last day the birds were seen by golfers was 25 April, and they reported both birds frequently flapped their wings while atop the nest. The nest was empty during my last visit on 28 April, and I saw no Great Blue Herons in the area. I believe the nestlings fledged.

I observed adults foraging twice. On 5 April an adult flew to the nest from a canal 60 m away. Similarly on 14 April I saw an adult foraging at the edge of this canal. On 19 April an adult called, flew into view from the east, landed on the nest, and regurgitated food which the young took from its throat and from the nest.

The nest and its contents survived the rigors of severe storms with strong winds on 11 and 21 April, despite the fact that the old pine, riddled with woodpecker cavities, swayed in less intense winds.

DesGranges (1979, Pp. 192-201 *in* Proc. 1977 Conf. Col. Waterbird Group) and Krebs (1974, Behaviour 51: 99-134) suggested that aggregations of herons allowed the birds to locate food rapidly, and both authors discussed the importance of rookery life to the breeding success of herons. In 1962 Allen (*in* Palmer, 1962) noted that "the development of real estate and so on, cause abandonment of heronries". The nest I observed succeeded in fledging young wthout the benefits of a heronry and demonstrates an adaptation of this species to the effects of the destruction of large areas of natural habitat.—**Marsha S. Winegarner,** Route 2, Box 180, Lake Placid, Florida 33852.

Florida Field Naturalist 11: 19-20, 1983.

REVIEWS

Nesting birds of Sanibel-Captiva and the barrier islands.—Hal H. Harrison. 1981. 52 pp., softbound $2.95. **Roseate Spoonbills and other wading birds of Sanibel-Captiva.**—Griffing Bancroft. 1981. 55 pp., softbound. $2.00. Both available from Sanibel-Captiva Conservation Foundation, P. O. Drawer S., Sanibel, FL 33957.—The Sanibel-Captiva Conservation Foundation has recently instituted a new series of publications on the natural history of the Sanibel-Captiva area. Twenty are planned. The present two are of particular interest to birders.

The first volume is an annotated checklist of nesting birds, with specific comments drawn from the author's own observations in the 1960s and early 1970s. Photographs by the author of nests of many of the species mentioned enhance the text.

A few minor errors and inconsistencies exist. In four cases the A.O.U. check-list (1957, fifth ed., Baltimore, Maryland, American Ornithologists' Union) order is not followed (Glossy Ibis, Black-necked Stilt, plovers, Mangrove Cuckoo). Three *possible* breeders (Long-billed Marsh Wren, Turkey Vulture, Blue Jay) are included while another, the Mourning Dove, is not. Two known former breeders, the Bobwhite and Eastern Meadowlark, are omitted while another, the Barn Swallow, is included. A breeding record for the Chimney Swift (Fred Lohrer pers. comm.) is not mentioned as it was not known to Harrison. Surely the Willet, and possibly the Purple Gallinule, nest in the area, but neither is noted. Just three "typos" were found: "Nothern" Mockingbird (twice) and "deterent."

These minor complaints aside, visitors to Sanibel and Captiva will find this a useful guide to the breeding birds of the area.

Bancroft's book, like Harrison's, is entertaining reading. The relaxed narrative treats all the long-legged waders found in the area and features the Roseate Spoonbill. For each species a description, translation of the Latin name, and comments about habits and local status are provided. Bancroft, drawing freely on his own field observations, gives the text a personal touch that I find charming. Line drawings by Steve Phillips illustrate each species. A selected list of references will be of interest to readers particularly interested in waders.

But the book is marred by errors of fact, interpretation, and typography. Some examples: White Ibis gain their white adult plumage at *one* year of age, not *two;* the Reddish Egret's bicolor bill is black at the tip and pink at the base, not dark blue and reddish yellow; young-of-the-year spoonbills are not *white,* but pale pink, with white heads and necks—and they are indeed seen in Florida. The White Ibis is not the most abundant wader in Florida; the Cattle Egret is. The account of Roseate Spoonbill populations, based largely on the work of Robert Porter Allen, makes too much of Allen's report of "fall" and "spring" nesting groups, which are treated here as genetically and geographically distinct populations. Many colonial birds in Florida have nesting seasons that appear to fluctuate according to local conditions, e. g., Brown Pelicans and Great Egrets, and spoonbills can reasonably be expected to exhibit the same flexibility. The presence of at least 12 typographical errors, including misspellings of two ornithologists' names, and three sentence fragments, further indicates lack of review in the preparation of this manuscript. There is much to enjoy in this book, both for birders and casual visitors. But I cannot recommend it in its present form.

Both books would be well served by a map of the area covered. If these volumes are any guide, the series would benefit from an editor. In revised editions, if any are contemplated, nomenclature and list order should follow the new 6th Edition of the A. O. U. check-list, due in 1983—**Richard T. Paul,** 1020 82nd Street S, Tampa, Florida 33619.

Birds of the Gainesville Region, Florida/A Checklist.—Oliver L. Austin, Jr., and John William Hardy. Third Edition, November, 1981. Florida State Museum, Gainesville, Florida, 25 pp.—This valuable little pamphlet, now in its third edition (first ed. 1972, second ed. 1975), deserves attention not only for the information it contains but also because it exemplifies an inexpensive alternative to the checklist card-format. The one-page forword includes the total number (283) of species currently recognized for Alachua County and lists the number of species in and defines each of the following categories: residents (75); summer residents (24); winter visitors (91); transients (35); and vagrants (49). Note two corrections: the species totals for each category add up to only 274; and, by my count, the list should include only 282 species. The Fort Pierce Sabine's Gull of October 1981, appearing on page 12, should not be included in the tally. Each species' entry usually contains one or two lines of information and gives status, dates of occurrence, and egg or fledgling dates. Also, this edition contains more information on changes in species' status than earlier editions.

As the Gainesville region is one of Florida's ornithologically best-known places, I was interested to see what changes had occurred in the region's avifauna in the nine-year period between the first edition (1 November 1972) and the third edition (1 November 1981). The first edition includes 254 species (counting Bullock's and Baltimore orioles as one species). Thus there is an increase of 28 species or almost three per year. Probably because of the increased skill and diligence of the Gainesville birding community, the increase in the list is primarily due to wintering or migratory vagrants, with the species about equally divided between non-passerines and passerines and including five shorebirds and six wood-warblers.

Since 1971, five winter species, already on the list, have become more common, Vermilion Flycatcher, Red-breasted Nuthatch, Northern Parula, Brewer's Blackbird, and Pine Siskin. Two other winter species, Short-eared Owl and Rufous Hummingbird, make their appearance on the list as possibly rare but regular and occasional visitor, respectively. There are changes in the breeding avifauna also. Sadly, the Red-cockaded Woodpecker and the Scrub Jay have become rare and the American Kestrel is now uncommon. Additions to the list of breeders include Wood Stork, Broad-winged Hawk, Belted Kingfisher (probably), Barn Swallow, Hooded Warbler, and Brown-headed Cowbird, and the Yellow-throated Vireo is now a common summer resident. None of southern Florida's numerous exotic parrots are on the list yet and unlike the situation in inland Polk and Highlands counties, the Laughing Gull is still considered a vagrant in Alachua County.

Oliver Austin, and his collaborator for this third edition, Bill Hardy, are to be congratulated for keeping this useful checklist up to date with frequent revisions. Florida's bird students will want this publication for their kit and, in anticipation of the next edition, they should make their predictions now for the changes that may occur in the avifauna of Alachua County.—**Fred E. Lohrer**, Archbold Biological Station, Route 2, Box 180, Lake Placid, Florida 33852.

Florida Field Nationalist 11: 22, 1983.

EDITORIAL

INFORMATION FOR CONTRIBUTORS TO THE FLORIDA FIELD NATURALIST

The *Florida Field Naturalist* is a quarterly publication of the Florida Ornithological Society. It is a refereed journal abstracted in the *Zoological Record, Biological Abstracts, Auk-Ibis* Current literature supplement, *Wildlife Review,* Recent literature of mammalogy, and *Herpetological Review.* The *Florida Field Naturalist* welcomes manuscripts containing the results of biological field studies and observations of vertebrates, especially birds, in and near Florida, the Bahamas, and nearby Antilles.

In preparing a manuscript for submission consult the information below and follow the conventions in recent issues of the journal. Submit manuscripts for publication to the editor. Each paper is reviewed by technical authorities who advise the editor on its acceptability. Manuscripts should be typed on one side of 8 1/2 x 11 inch white paper. Do not use erasible bond. Type everything double-spaced, including titles, addresses, literature, and tables. Leave at least one-inch margins all around to allow room for editorial notes and instructions to the printer. Type tables on separate sheets using space efficiently. Inclusion of pertinent photographs is encouraged. They should be glossy black-and-white prints of high contrast and sharpness about the same size as they will appear in print. Diagrams and line drawings should be in black India ink. Use transfer lettering (available at stationery stores) or mechanical lettering. In choosing lettering, consider that, in final published size, characters should be no smaller than 1.5 mm high. For further ideas on preparing illustrations, consult the editor or recent issues of the *Florida Field Naturalist* and other ornithological journals.

Titles should be short and descriptive, and the body of the article concise. Follow the form and style of a recent issue of the Florida Field Naturalist. Major articles, six to 20 typed pages, should when appropriate be divided into sections for introduction, methods, results, discussion, summary, acknowledgments, and literature. All articles must have a summary. Notes, of one to six typed pages, may be divided into sections if desirable and also must end with a summary sentence or paragraph.

All references should be cited in the text and listed in a "literature cited" section. In the text, citations with one or two authors should indicate authors and year of publication, e.g. (Howell 1932). If there are more than two authors list the first followed by "et al.", e.g. (Blair et al. 1968). Indicate specific pages of longer works, e.g. (Howell 1932: 50). If there are five or fewer references they should be cited only in the text using an expanded format, e.g. (Howell 1932, Florida bird life, New York, Coward McCann) or (Cruickshank 1974, Fla. Field Nat. 2: 1-3).

Express all measurements in the metric system. If desired the equivalent value in the English system may be added in parentheses. Use abbreviations for measurement units in text when they follow a quantity (12 km, 6 h). Spell out numbers less than 10 unless they are followed by a measurement unit (six birds but 6 cm). Use the 24-hour time system (07 00 or 16 45) and the military date system (4 July 1976).

Capitalize the English name of birds, and follow the first mention of a species by its scientific name, underlined, in parentheses. Scientific and common names of vertebrates must follow these sources: for birds use American Ornithologists' Union check-list of North American birds (sixth edition), see Supplement to the Auk Vol. 99, No. 3, 1982; for reptiles and amphibians use Collins et al. (1982), Standard common and current scientific names for North American amphibians and reptiles (second edition), Society for the Study of Amphibians and Reptiles, Herpetological Circular 12; for fishes use Robins et al. (1980), a list of common and scientific names of fishes from the United States and Canada (fourth edition), American Fisheries Society Special Publ. No. 12. For other animals and plants cite the sources used, in the methods section.

The *Florida Field Naturalist* encourages the submission of reports on the changing distribution and occurrence of rare species in its geographic area. All records of occurrences of birds in Florida submitted for publication are reviewed for acceptability by the Records Committee of the Florida Ornithological Society. Prior or simultaneous submission of a record to the committee on its standard form will decrease the time and expense required to consider it for publication. Notices of a record in *American Birds*, newsletters, or Records Committee reports do not preclude submission of a paper with additional details to the *Florida Field Naturalist*, but previous notices should be cited. All reports must contain the time, place (including county), circumstances, and documentation of the observation sufficient to assure proper indentification was made. Specimens and photographs should be deposited in a scientific collection. Give their accession numbers in text. The Florida State Museum is the official depository for the Florida Ornithological Society. Citations of other pertinent records, a summary of overall status of the species, and a discussion of relevant biological factors should be part of most reports. Distribution notes are encouraged from observers who have not previously written such reports. If presubmission assistance with distribution notes is desired, contact the associate editor (for distribution reports), who can provide advice on the desirability of submission, information included, format of presentation, and composition of the note prior to submission for the editor's consideration.

The *Florida Field Naturalist* especially encourages submission of behavioral notes and the results of scientific field studies. Notes on behavior need not be the first published report but should take into consideration previously published information. Consideration should also be given to interpreting the biological, ecological, or evolutionary significance of the behavior reported. Field studies must conform to standard scientific criteria for study design, analysis, and interpretation. Hypotheses should be clearly stated and data should be subjected to statistical testing where appropriate. Presubmission advice on the writing of scientific studies can be sought from the associate editor (for scientific reports).

The *Florida Field Naturalist* publishes reviews of books, monographs, and other material of interest to its readers. Materials to be considered for review should be sent to the associate editor (for reviews). Unsolicited reviews may also be submitted to the associate editor (for reviews). An annotated list of scientific articles referring to Florida birds is published annually. Authors wishing to have papers included in this feature should send reprints to the associate editor (for reviews).

FLORIDA FIELD NATURALIST

Quarterly publication of the Florida Ornithological Society

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Species index to Florida bird records in Audubon Field Notes and American Birds Volumes 1-30 1947-1976, by Margaret C. Bowman. xii + 42 pp. 1978. Florida Ornithological Society, Special Publication No. 1. Price $3.75. Order prepaid from the Assistant to the Treasurer.

FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

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PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 11, NO. 2 MAY 1983 PAGES 25-44

COMPOSITION AND BEHAVIOR OF MIXED-SPECIES FLOCKS OF FOREST BIRDS IN NORTH-CENTRAL FLORIDA

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As in probably all other forested regions of the world, the forest canopy birds of north-central Florida associate in mixed-species flocks during the non-breeding season. These flocks appear to form around intraspecifically-social groups of Carolina Chickadees and Tufted Titmice (scientific names of birds are listed in Table 1). The flocks typically contain several individuals of these two species plus several other attendant individuals from a constantly changing complex of resident and migrant species. Mixed-species flocks with comparable species composition from Louisiana and Maryland have been described by Morse (1970) but have not been described previously for Florida. In this paper I describe the species composition of these flocks, the patterns of aggression within and between flocks, and the patterns of movement for flocks in north-central Florida during the winter of 1977-78.

STUDY AREA

I studied flocks in approximately 50 ha of the 2200-ha San Felasco Hammock State Preserve, 20 km NW of the University of Florida campus, Gainesville, Alachua County, Florida. The site was at least 3 km from the nearest public road.

The study area contained an open stand of long-leaf pine (*Pinus palustris*) and turkey oak (*Quercus laevis*) which sloped off gradually on three of four sides into denser second growth loblolly pine (*Pinus taeda*) and turkey oak. On the fourth side was a much denser second growth woods of sweetgum (*Liquidamber styraciflua*), southern red oak (*Quercus falcata*), mockernut hickory

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Florida Field Naturalist 11: 25-34, 1983.

TABLE 1. Bird species participating in mixed-species flocks in north-central Florida.

Species	No. of flocks in which species occurred	No. of ind./ flock ± SD	% of total flocks in which species occurred	% participation[1,2]	Date of 1st obs.[3]	Date of last obs.[3]
Tufted Titmouse *Parus bicolor*	58	3.8±1.4	96.7	—	—	—
Carolina Chickadee *Parus carolinensis*	49	3.8±1.2	81.7	—	—	—
Pine Warbler *Dendroica pinus*	39	2.6±1.8	65	—	—	—
Yellow-rumped Warbler *Dendroica coronata*	36	11.3±5.6	60	80	10-3	—
Black-and-white Warbler *Mniotilta varia*	35	1.1±0.3	58.3	71.4	10-3	—
Yellow-throated Warbler *Dendroica dominica*	33	1.1±0.2	55	—	—	—
Ruby-crowned Kinglet *Regulus calendula*	26	4.3±1.8	43.3	57.8	10-24	—
Solitary Vireo *Vireo solitarius*	26	1.1±0.3	43.3	55.3	10-14	—
Downy Woodpecker *Picoides pubescens*	22	1.4±0.5	36.7	—	—	—
Brown Creeper *Certhia familiaris*	19	1.0±0	31.7	54.3	12.3	2-24
Red-bellied Woodpecker *Melanerpes carolinus*	18	1.6±0.6	30	—	—	—
Blue-gray Gnatcatcher *Polioptila caerulea*	9	1.2±0.4	15	—	—	—
Northern Parula *Parula americana*	9	1.4±0.7	15	69.2	—	10-12
American Goldfinch *Carduelis tristis*	8	6.6±1.9	13.3	30.8	1-3	2-24
White-eyed Vireo *Vireo griseus*	7	1.0±0	11.7	—	—	—
Orange-crowned Warbler *Vermivora celata*	6	1.3±0.5	10	13.6	10-3	2-10
American Redstart *Setophaga ruticilla*	3	1.0±0	5	30	9-11	10-14
Yellow-throated Vireo *Vireo flavifrons*	3	1.0±0	5	37.5	—	9-13
Eastern Phoebe *Sayornis phoebe*	3	1.0±0	5	13.04	10-24	1-13

(Table 1. Continued)

Species	No. of flocks in which species occurred	No. of ind./ flock ± SD	% of total flocks in which species occurred	% participation[1,2]	Date of 1st obs.[3]	Date of last obs.[3]
Red-breasted Nuthatch *Sitta canadensis*	3	1.0±0	5	50	10-24	12-3
Palm Warbler *Dendroica palmarum*	2	1.0±0	3.3	—	—	—
Yellow-bellied Sapsucker *Sphyrapicus varius*	2	1.0±0	3.3	—	—	—
Eastern Wood-Pewee *Contopus virens*	1	1.0±0	1.7	100	10-12	10-12
Blackburnian Warbler *Dendroica fusca*	1	1.0±0	1.7	100	10-24	10-24
Cerulean Warbler *Dendroica cerulea*	1	1.0±0	1.7	100	11-2	11-2

[1]Number of flocks in which species occurred/number of flocks observed during period in which species was present in study area X 100.
[2]Dash (—) indicates that the species was present throughout the study period.
[3]Dash (—) indicates that the species was present at beginning or end of the study period, whichever applicable.

(*Carya tomentosa*), and laurel oak (*Quercus hemisphaerica*). This second-growth deciduous woods continued to slope toward a small swamp surrounded by a relatively mature stand of laurel oak, pignut hickory (*Carya glabra*), basket oak (*Quercus michauxii*), and magnolia (*Magnolia grandiflora* and *M. virginiana*). A power line corridor 40 m wide crossed through the study area.

Methods

From September 1977 through March 1978 I followed mixed-species flocks and began attempting to mark birds for individual identification in December 1977 using mist nets to catch the birds. I marked several chickadees and titmice with colored plastic leg bands and U.S. Fish and Wildlife Service aluminum bands. I censused flocks after 10-15 min of the initial encounter, then followed them for periods of up to 5 h. I recorded the flock's position irregularly at 5 to 30 min intervals and when the flock crossed a notable landmark or changed direction. I later reconstructed the flocks' routes on maps of the study area and then used them to calculate distances and rates of flock movement. I also constructed a composite map to measure flock territory sizes.

Results

Flock Composition

In 60 periods of continuous observation of a mixed-species flock, I observed 25 species that appeared to show some affinity to the flocks (Table 1). The flocks usually contained both Carolina Chickadees and Tufted Titmice. Species associations without these two species lacked cohesiveness and soon disintegrated. Nine species occurred in fewer than five flocks, because they were present in the study area only for brief periods (such as Cerulean Warbler, Blackburnian Warbler, Eastern Wood Pewee, American Redstart, and Red-breasted Nuthatch) or because they had little affinity for the mixed-flocks (such as the Yellow-bellied Sapsucker, Eastern Phoebe, Yellow-throated Vireo, and Palm Warbler).

The flocks contained an average of 6.9 species (SD = 1.9, range = 3-11) and an average of 21.7 individuals (SD = 9.4, range = 7-40). Several attendant species, the Black-and-white Warbler, Yellow-throated Warbler, Brown Creeper, and Solitary Vireo, typically occurred singly within the flocks. The Ruby-crowned Kinglet and American Goldfinch occurred in intraspecific groups of four to eight individuals that joined and left the flocks together. Pine Warblers usually occurred singly or in pairs, but occasionally up to six individuals occurred with the mixed-flocks. The frequency of occurrence of the White-eyed Vireo in the flocks (Table 1) is almost certainly an underestimation, because it tended to remain in dense thickets and was usually noticed only when the flock crossed a road or clearing.

The study area contained two titmouse flocks with territories of 13.5 and 11.3 ha (Fig. 1). There appeared to be only one chickadee flock in the area of the two titmouse territories. Their border appeared to coincide for the most part with the outer border of the two combined titmouse territories but may have extended past the boundary to the north.

Intraflock Aggression

I observed 59 acts of intraflock aggression (Table 2). These consisted either of attacks followed by chases or of supplanting attacks, in which the aggressor flew directly at another bird and landed where the victim had been. The two nuclear species accounted for 73.7% of these acts of aggression; 47.5% overall were interspecific.

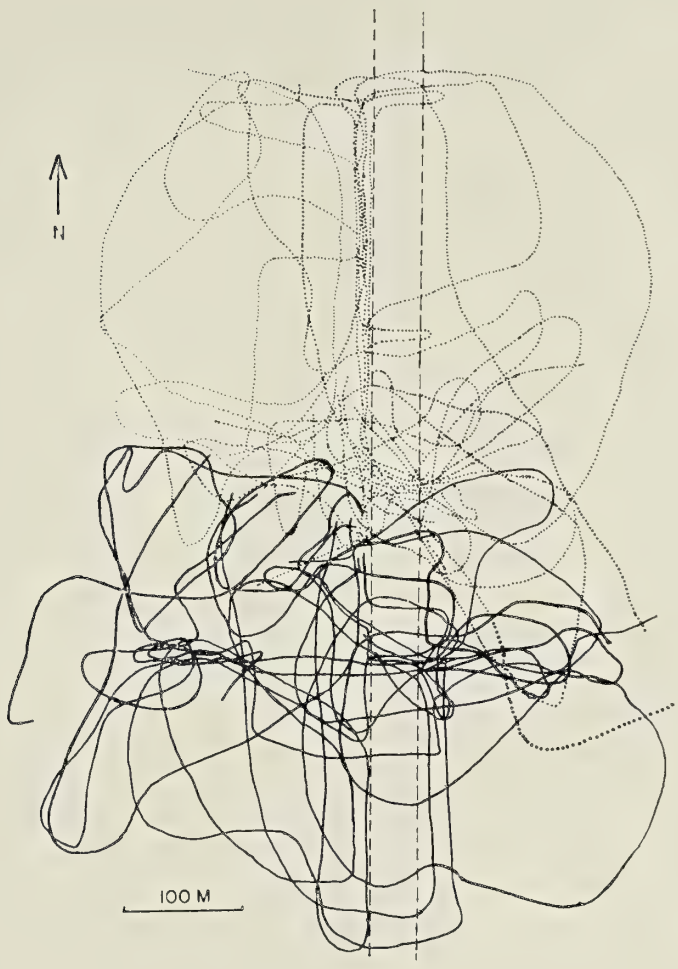

Fig. 1. Composite map of paths taken by mixed species flocks. Solid lines indicate one Tufted Titmouse flock; dotted line indicates the other Tufted Titmouse flock; dashed lines indicate borders of power line corridor.

Aggression became most frequent in February (Fig. 2), reaching a peak of 0.22 aggressions/h of observation. Titmice were the principal antagonists in the flocks, accounting for 67.8% of interspecific aggressions (Table 2). Chickadees were their most frequent victims (40.6% of titmouse aggressions).

In terms of attacks received per sighting (number of attacks received/number of flock censuses containing a given species), the Yellow-throated Warbler was the most frequent victim of aggression. I never observed it showing hostility toward any other bird, but because it typically occurred singly in the flocks, it is possible that it excluded conspecifics. The Pine Warbler was the main aggressor against the Yellow-throated Warbler. This aggression occurred as displacements from long-leaf pine needle tufts. Nevertheless, the Yellow-throated Warbler persistently returned to the needle tufts within several minutes of being displaced.

TABLE 2. Aggressive interactions among flock members.

Victim	RbW	CC	TT	BC	SV	BwW	CW	YtW	PW	Total
Red-bellied Woodpecker										0
Carolina Chickadee		16	13							29
Tufted Titmouse	1		13							14
Brown Creeper						1				1
Solitary Vireo					1					1
Black-and-white Warbler						1				1
Cerulean Warbler										0
Yellow-throated Warbler		1	2				1		5	9
Pine Warbler			4							4
Total	1	17	32	0	1	2	1	0	5	59

MOVEMENT PATTERNS

In the few cases in which flocks were followed for longer than 3 h, and in which they were not exposed to the threat of predation by either Sharp-shinned (*Accipiter striatus*) or Cooper's Hawks (*A. cooperii*), the flocks were regularly saltatory in their movements, tending to drift slowly for an hour to an hour and a half and then to move rapidly to another area and repeat the cycle. When the flocks were exposed to the hawks, however, they showed altered this pattern. When the hawk was sighted by a flock, a high whistle alarm call was given by a titmouse or chickadee, and all birds stopped all activity and waited for one to 10 minutes before resuming activity (mean = 5.5 min) (Gaddis 1980). Upon resumption of activity, the birds usually left the area at a rapid pace and then continued to move erratically. Frequent changes in direction accompanied this erratic movement rate.

The composite map of the movement paths of the two titmouse flocks (Fig. 2) indicates that flock territories were consistently held but also that considerable overlap occurred between them. Certain areas along the border between the two titmouse flocks and along the power line appeared to be more frequently traversed than others, but I observed no overall pattern in the flocks' routes.

The flocks moved at an overall average rate of 324 m/hr throughout the period of study, but large seasonal and daily variations occurred in these rates (Table 3). This table suggests a decrease at midday and an overall increase from January to February to March (differences in total monthly rates as well as daily rates are all significant at $p < .001$, Student's t-test). However, this pattern was not necessarily consistent within subcategories; reversals of the overall

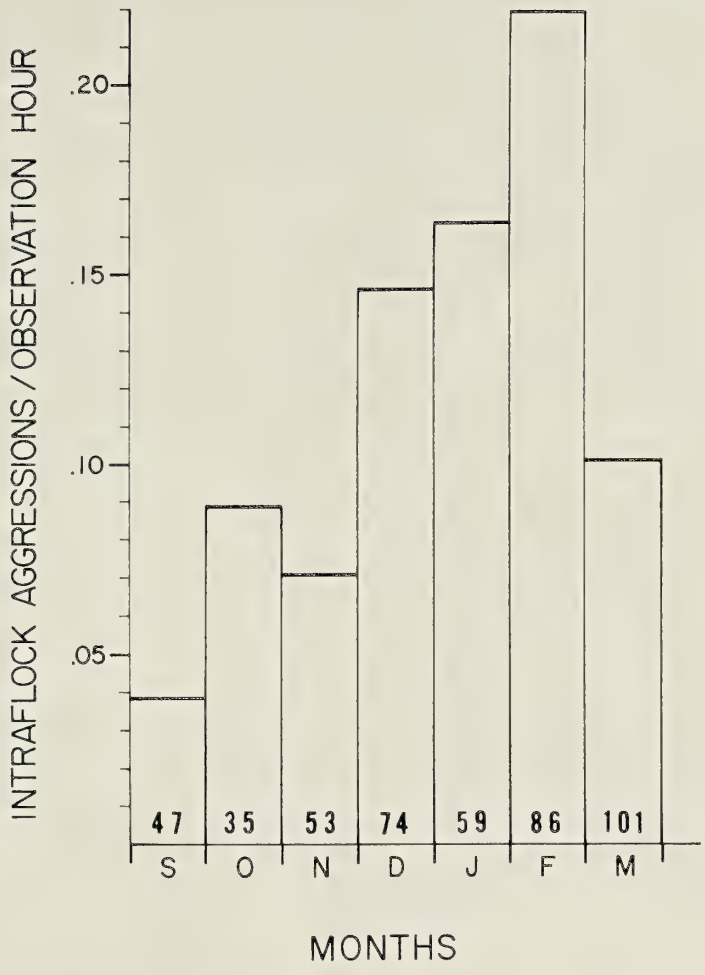

Fig. 2. Monthly rates of intraflock acts of aggression. Number of observation hours for each month is indicated in the bottom of each bar.

daily trend occurred in February and March, and only the 1000-1400 time period showed the overall seasonal trend.

Linear regression of movement rates vs. flock size in terms of both number of individuals/flock and number of species/flock showed no significant correlations. Nor were the correlations improved by separating the data into deciduous and coniferous habitats, i.e. the patterns of flock movement appeared to be equally uninfluenced by flock size in coniferous as well in deciduous woods.

Interflock Aggression

The titmouse and chickadee flocks trespassed widely in neighboring territories, and interflock fights commonly resulted. When these interflock fights occurred, the fighting was exclusively intraspecific and involved only the nuclear species, i.e. titmice and chickadees. Thus, titmice fought against titmice, chickadees fought against chickadees, and attendant species avoided the conflict. Interflock

TABLE 3. Flock movement rates (m/h) ± SD by months and by times of day.

Time of day	Dec.-Jan.	February	March	Total
0700-1000	362.5±118.6 N = 8	267.5±122.5 N = 11	355.6± 62.2 N = 4	362.03±179.3 N = 23
1000-1400	273.3±131.04 N = 17	303.1±148.01 N = 11	453.7±191.4 N = 4	311.7±172.3 N = 32
1400-1800	604.9±195.3 N = 4	234.7±166.1 N = 5	280.0±147.7 N = 3	377.6±154.1 N = 12
Total	305.9±121.1 N = 29	319.5±159.0 N = 26	381.7± N = 11	323.9±159.2 N = 66

confrontations consisted of excited vocal exchanges among the nuclear species with frequent attacks and chases. Titmice occasionally locked claws and fell to the ground in grappling combat. Vocal exchanges could extend for up to an hour.

DISCUSSION

The patterns of aggressive interactions reported by Morse (1970) for mixed species flocks in Louisiana and Maryland were similar to those I saw in Florida. In Louisiana and Maryland, as in Florida, at least half of all aggressions were made by Carolina Chickadees and Tufted Titmice. The proportion of inter- to intraspecific attacks was much higher for the Tufted Titmouse than for the Carolina Chickadee in the Louisiana and Maryland flocks as it was also in Florida. Furthermore, in Louisiana and Maryland, the Tufted Titmouse accounted for 29.8% of all interspecific aggressions (compared to 67.8% in Florida) and the Carolina Chickadee was its most frequent victim (47.1% of titmouse aggressions, 40.6% in Florida).

In spite of this disproportionately high interspecific aggressiveness of the Tufted Titmouse, Morse (1970:132-134) concluded that flock leaders showed a "low level of interspecific hostility." Morse further suggested that this characteristic of the leaders may contribute to their attractiveness to other species. The idea that nuclear species in mixed-species flocks should show low interspecific aggressiveness has also been suggested by Moynihan (1960), but I believe it appears to be questionable for the case of the Tufted Titmouse in

Morse's data from Louisiana and Maryland flocks and in my own from Florida flocks.

The overall pattern of movement rates shown by the Florida flocks appeared also to be shown by the mixed flocks led by Carolina Chickadees in Tennessee studied by Wallace (1970). Although Wallace's sample sizes were too small for confident interpretation, a rate decrease at midday was suggested. No overall seasonal trend was apparent. Odum (1942) also reported a decrease in movement rate at midday in Black-capped Chickadee (*Parus atricapillus*) flocks in New York, but he presented no data on the seasonality of the phenomenon.

That the midday decrease in movement rate was not expressed in February and March in the Florida flocks probably reflected the decreasing availability of foraging resources during those months. Long-leaf pine seeds had been abundant until late December and early January, and served as a major foraging resource for the nuclear species. While the parids were foraging on these seeds, they would often cease activity entirely for up to an hour during midday. However, when the long-leaf pine seed resource was depleted, not only did aggression rates increase dramatically (Fig. 1) but also the midday rest periods were no longer observed.

Morse (1970:154) reported a general tendency for large flocks to move faster than smaller ones. He further reported differences in the relationships between flock size and rate of movement in coniferous as opposed to deciduous woods, although he did not report the levels of statistical significance for the correlations. My data fail to confirm Morse's conclusion that the relationships between flock size and movement rate are different in the different habitat types, and they also fail to confirm the presence of a significant overall correlation between the two variables. Morse (1970) considered that the suggested correlation was explainable in terms of scarce food reserves, to which large flocks are probably subjected, and the resulting need for individuals in large flocks to forage over larger areas. (The basis for his assumption of scarce food reserves is that larger flocks were found where overall bird densities were low, and, from Gibb (1960), that bird densities in England were low where reserves were low.) Although I found no correlation between flock size and movement rate in the Florida flocks, their increase in movement rate in February and March could possibly have been due to a decrease in availability of food (following the depletion of long-leaf pine seeds), which would be consistent with Morse's suggestion.

Summary

Winter flocks that formed around Carolina Chickadees and Tufted Titmice contained an average of 6.9 species (SD = 1.9, range = 3-11, N = 60) and 21.7 individuals (SD = 9.4, range = 7-40). The flocks moved at an overall rate of 324 m/h (SD = 159.2, N = 66). A composite map of flock movements showed that no regular routes were used.

Fifty-nine acts of aggression were observed, 47.5% of which were interspecific. The Tufted Titmouse, one of the two nuclear species, accounted for 67.8% of the interspecific aggressions. A seasonal increase in aggression was shown with a peak in February of 0.22 aggressions/observation hour.

Acknowledgments

A Sigma Xi grant-in-aid of research helped to finance this research. Vickie Duncan Tillman assisted with the fieldwork. Helpful comments on the manuscript were provided by J. W. Hardy and Mary LeCroy.

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LATE FALL MOVEMENTS OF TURKEY VULTURES AND HAWKS IN THE FLORIDA KEYS

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From 10 November to 14 December 1981, while at Coral Key Village, 18 km northeast of Marathon, Monroe County, Florida, I observed and followed movements of groups of 30 to 400 Turkey Vultures (*Cathartes aura*) and hawks along the Florida Keys. These birds moved by kettling, or spiraling to high altitude and then gliding. This behavior permits moving many kilometers with minimal wing action. Birds leave the top of a kettle in a sloping glide toward their next objective, in my observations an island (key). Forward speed is controlled by the glide angle, but altitude is always lost. In the Keys this loss is accelerated by birds coming in over water. Until this visit to the Keys, I had never before witnessed vultures and hawks kettling over the ocean.

Weather on the days of my observations was cool but clear. During this period, cold fronts crossing the Keys caused winds to come out of the northwest. With the passage of these fronts, winds shifted, coming from the north or northeast and decreased to 13-16 kph. Because such weather conditions created light thermals, particularly in the early morning, the birds I saw, in some cases, circled for as long as eight min, attaining altitude before moving from key to key. This situation aided my observations because I was able easily to maintain contact with the groups and also was assured that they would arrive over the next key at an altitude permitting relatively close observation.

OBSERVATIONS

In the late afternoon of 15 November 1981, I watched a group of vultures and hawks arrive at Grassy Key from the direction of the Lower Keys and go to roost in a stand of Australian pine trees (*Casuarina* sp.). The next day a group of 355 Turkey Vultures formed into four kettles and moved northeastward along the Keys. One adult and 33 immature Broad-winged Hawks (*Buteo platypterus*), 14 immature Swainson's Hawks (*Buteo swainsoni*) (five light, seven intermediate, and two dark), and eight Sharp-shinned Hawks (*Accipiter striatus*) were involved. I followed the birds by car to the northern end of Lower Matecumbe Key, approximately 32 km northeast. There each group changed course abruptly to the

northwest and headed over Florida Bay in the direction of Flamingo, 36 km away. I assumed that these birds were returning from the Key West area where they had not attempted crossing the Florida Straits. It is not clear why they would strike out across Florida Bay, but they may have been retracing the course they followed moving to the Key West area in the first place.

On 20 November, I watched 3 kettles of vultures, also moving to the northeast, over Plantation Key. None crossed the Bay. These groups included 138 Turkey Vultures, three immature Swainson's Hawks, and eight immature Broad-winged Hawks. Although movements of Turkey Vultures continued at least until I left the Keys on 14 December, I did not see hawks in the Turkey Vulture kettles after 20 November.

On 11 December, a large, dry cold front passed through the Keys. The next day was clear with a 15 kph wind from the northeast and a temperature of 18 C in the early morning. Around 1000, I saw 310 Turkey Vultures, equally divided between two kettles 1.5 km apart, on the ocean side of the Keys between Duck Key and Grassy Key. When the birds started to leave the kettles they headed southwest, and I followed them by automobile to Key West, 98 km away. They remained on the ocean side until arriving at the lower end of Saddlebunch Keys, just outside Key West, where they crossed US highway 1 continuing their southwestward course. I lost contact with them at this point, but on the outskirts of Key West I found 82 vultures coming in from the northwest. Some began circling over the municipal golf course while others landed on television towers. Later that day I followed 190 Turkey Vultures in three kettles from Sugarloaf Key, again, to the lower end of Saddlebunch Keys. Here they continued on the same course as the first two groups. Twice during midday hours I searched Key West for large groups of vultures but found none. At 1500, between Marathon and Conch Key the movement was still going on, as I saw 387 Turkey Vultures in nine kettles (min. 30 birds, max. 54 birds, mean 43 birds), all on the ocean side moving southwest.

I believe that the majority of the 1 000+ Turkey Vultures I observed on 12 December actually left Florida and that it was a major migration movement. The birds I saw in the Marathon-Conch Key area may have been an exception, because they may have arrived in Key West too late in the day for a successful water crossing. If the birds had not left the Keys, 600 to 700 vultures should have been sailing around over the Key West area in the early afternoon, but I could find no trace of birds in such numbers.

Discussion

The very large numbers of Turkey Vultures moving up and down the Keys in late fall was far greater than the number of participating hawks. However, for neither group is it clear whether the birds were migrating or were involved in local movements. Similarly, at northern migration lookouts, such as Hawk Mountain in Pennsylvania, passing Turkey Vultures are not recorded because there is no way of separating migrants from local or wintering birds. Of interest is G. Menk's report of a "presumed late migration of Turkey Vultures just ahead of a cold front, near Tallahassee" on 9 December 1978 (Stevenson 1979).

With the exception of certain members of the Falconidae, most migrating hawks seem reluctant to cross large bodies of water, if they can be avoided. For example at Cape May Point, New Jersey, thousands of hawks arrive in the fall and face a relatively short (about 32 km) crossing of Delaware Bay. Some birds move up the west side of the Point and cross at a narrower spot, but others move back down to the Point again, only to turn around and fly northward a second time. Wind direction and strength have been found to contribute to this reluctance to move on. Reconnoitering or milling about is most common among *Buteo* sp. and Sharp-shinned Hawks. I believe that the same situation may exist in the Keys during the migration period and late fall. Kennedy (1975) reported that on 12 November 1974 "hawks were observed (no mention of species or numbers) moving both southwest and northeast at the Audubon Society Research Station at Tavernier". At Cape May the birds must move on with little delay, whereas on the Keys, they can remain for the winter.

If the northward movement of hawks and vultures I observed on 16 November had occurred in September or early October, the hawks might have continued north, eventually to round the Gulf Coast to eastern Texas and there join the major fall flyway for southbound Broad-winged and Swainson's Hawks. Evidence of such reverse migration is well documented for both the east and west coasts of Florida. Simons (1977), Edscorn (1979), and Atherton (1981) mentioned nine such observations with Sharp-shinned Hawks making up 95% of the individuals reported. No buteos were mentioned in any of these reports, which is hardly surprising, because all observations were made on the coast where movements of buteos would be rare. Rather, where possible, I would expect buteos to occur inland where they can find better thermals for soaring, but

where coverage by observers is so difficult that sighting them would be fortuitous.

Another similarity between Cape May Point, New Jersey and the Keys is the migration of Broad-winged Hawks. Their usual flyway out of New England crosses through northern New Jersey, southwest into Pennsylvania and down through the Appalachian Mountains. Clay Sutton (pers. comm.) of the Cape May Bird Observatory has maintained that the large numbers of Broad-winged Hawks appearing each fall at Cape May Point, well south of the main flyway, have in a sense trapped themselves. Sutton (pers. comm.) points out that each year 90% of the Broad-winged Hawks there are immature birds. This could be interpreted to mean that as adults they apparently don't make the same mistake. In the Keys, Mrs. Frances Hames (pers. comm.) of Key West has informed me that the vast majority of Broad-winged Hawks passing through the Keys each fall also are immature birds and that the winter population is usually exclusively immatures (cf. Hundley and Hames (1960)).

What happens to the birds once they leave Key West is something of an enigma, many people do not believe they cross the Straits of Florida. On the other hand, Mrs. Hames (pers. comm.) has told me that she has watched Broad-winged Hawks fly out over the Straits and has stayed at her vantage point long enough to determine that they did not return. D. and K. MacVicar observed 200 Broad-winged Hawks on 26 October 1980 and 1000 on 8 November 1980 over Key West (Atherton 1981). Unfortunately, there was no information presented on the direction they were headed. A number of spring and fall observations of vultures and hawks have occurred in the Dry Tortugas (Sprunt 1962). Bond (1980) considered the Broad-winged Hawk to be rare and casual throughout the West Indies and the few records for Cuba, surprisingly, are from its eastern-most province, Oriente. Peterson (1973) stated that this species migrates through eastern and southern Mexico, except the Yucatan Peninsula. In my opinion neither of these statements would preclude a movement of vultures and hawks to a destination of Yucatan. From Key West the shortest distance to Cuba is 150 km and from the western tip of Cuba to the coast of Yucatan is 190 km. The actual course is speculative, but certainly the determining factors would be wind direction and strength. Broad-winged Hawks and possibly even a few Swainson's Hawks passing through the Keys each fall are definitely off the main southbound flyway, and their numbers are minimal when contrasted with

those recorded over Panama for the same period. Since these birds will be in the air constantly and on the move, descending only in late afternoon to roost, or possibly when held up by weather, sightings over the water, western Cuba, or Yucatan, are most unlikely. High-flying, migrating hawks are easily overlooked. For example, the above observation by the MacVicars of 1000 Broad-winged Hawks over Key West. The Atherton (1981) report made no mention of other sightings for that day or prior days in the Keys, or for that matter, anywhere in the State. Nor were there any sightings of that magnitude reported after 8 November.

It will be quite an undertaking to determine the pattern of these large-scale vulture movements up and down the Keys. Hopefully observers reporting spring and fall migration or movements of vultures and hawks will include sufficient data to be of value to future consideration of this subject.

Summary

From 10 November to 14 December 1981, I observed movements of Turkey Vultures and hawks along the Florida Keys, Monroe County. A majority of the 1000 Turkey Vultures appeared to have left Florida flying south. Others may have participated in a local movement. Additional information is needed to understand the nature of such movements.

Acknowledgments

I wish to acknowledge and thank William B. Robertson, Jr., and James A. Kushlan, Everglades National Park, Homestead, Florida, Dean Amadon, Tenafly, New Jersey, Alexander Sprunt, IV, Director, Audubon Research Center, Tavernier, Florida, Mrs. Frances Hames, Key West, Florida, Clay Sutton, Cape May Court House, New Jersey, and Robert Duncan, Gulf Breeze, Florida for their assistance and helpful suggestions. However, I am responsible for all assumptions and speculations.

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NOTE

Distribution of coyotes in Florida.—A natural range extension by coyotes (*Canis latrans*) into the eastern United States has been well documented (Paradiso 1960, 1966, Richens and Hugie 1974, Taylor et al. 1976), and the presence of coyotes in Florida has been previously reported (Bailey 1933, Cunningham and Dunford 1970, Sherman 1937, Young and Jackson 1951:16). However, the existence of an established coyote population in Florida is known from the literature only in the Lake Wales area of Polk County (Cunningham and Dunford 1970, Layne 1974), and the current statewide status of the coyote has not been documented.

In recent years, the frequency and distribution of coyote records seemed to suggest the presence of a more substantial population than was indicated in the literature. Therefore, in 1981 a mail survey of 167 state, federal and university personnel was conducted to gather information about the statewide distribution of coyotes. Survey recipients were asked to indicate on a map the location of sightings, kills, or other evidence of coyote occurrence.

Sixty-nine individuals, representing all areas of the State, returned survey maps. Respondents reported 26 specimens, 4 sightings and 16 areas that yield frequent, reliable reports (Fig. 1). Although several respondents provided records from as early as the 1950's, no records prior to 1975 were used in the

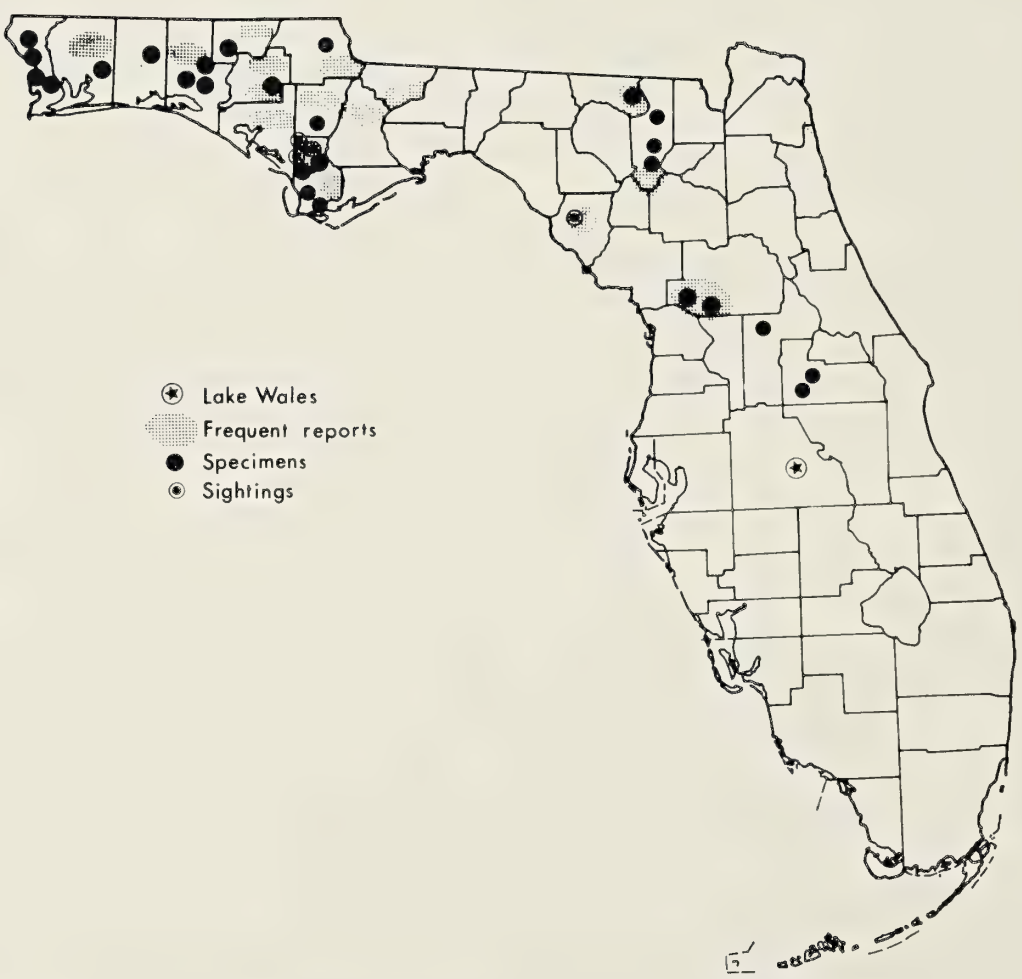

Fig. 1. Distribution of recent coyote records from Florida.

analysis. The composite map (Fig. 1) indicates a distribution of coyotes through much of the Florida Panhandle and along the Central Highland Ridge from Hamilton County to Polk County. Noteworthy is the absence of records from south Florida and the Lake Wales area of Polk County. Bailey (1933), Sherman (1937) and Young and Jackson (1951:16) reported coyote introductions in Palm Beach and DeSoto counties and coyotes killed in Collier and Monroe counties. Our findings, however, support Layne's (1974) doubts that coyotes currently occur in south Florida. Whether the absence of records from the Lake Wales area indicates a loss of coyotes there or simply an error in the survey method is not known.

Richens and Hugie (1974) characterize Eastern coyotes as being opportunistic feeders and as exhibiting a wide tolerance for habitat types. They associate the eastward movement of coyotes with a gradually changing habitat preference and conclude that there is no barrier to coyote range expansion except adequate food supplies. Therefore, assuming that coyotes are well established in northern Florida, the eventual occupation of the entire State seems inevitable.

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[1]Deceased

REPORTS

Summary of the 1982 fall meeting.—The fall meeting of the FOS was held 22-24 October 1982 at the Holiday Inn, Titusville. Its great success was thanks to the efforts of Bob Brown, who outdid himself as host. He not only planned a fine meeting but also gave FOS a handsome wooden sign bearing the name of the society and supplied a canvas bag in which to ship it. Furthermore, he saw to it that we had no expenses but plenty of profits from the meeting. Before the photographers' round-up on Friday evening, Mark Trafton spoke on the "Birds of Merritt Island NWR and Port Canaveral". Herb Kale's skin quiz was won by Glen Woolfenden. Jack Dozier and Lyn Atherton were runners-up. The scientific session included papers on the Florida Breeding Bird Atlas by Herbert W. Kale, "The status and distribution of the Florida Scrub Jay" by Jeffrey A. Cox, "Vocal behavior of Seaside Sparrows" by Mary Victoria McDonald, "Wood Stork reproductive success and movement patterns in central and north Florida" by James A. Rodgers, Jr., "Bird remains from Indian sites in central California" by Diana G. Matthieson, and "Ecologic, geography and conservation of western Atlantic marine turtles: new evidence of the importance of south Brevard beaches and lagoons" by Llewellyn M. Ehrhart.

At the meeting of the board of directors, Wally George was reappointed to the Records Committee. Helen and Bill Dowling were given a vote of appreciation for their work on the Membership Committee. It was agreed to have a representative on the Florida Breeding Bird Atlas committee. A policy was adopted to sell our membership list (to be used one time only) to projects that are of interest or benefit to the members. Requests will be carefully considered by the executive committee in order to protect the members from unwanted mail.

Helen Cruickshank's program at the dinner Saturday evening entitled "Florida Audubon African Safari" was a delight, receiving rave revews on her presentation and magnificent slides. FOS is fortunate to have this lovely lady as an honorary member and doubly fortunate that she so graciously shared her photography with us.

The Francis M. Weston Audubon Society invited the FOS to hold its annual meeting in Gulf Breeze on 15-17 April 1983 with Lucy and Bob Duncan as hosts. Bob Loftin extended an invitation to return to Jacksonville in the fall of 1983. Dave Goodwin, on behalf of the St. Petersburg Audubon Society, invited FOS for its annual meeting in 1984.—**Barbara C. Kittleson,** 5334 Woodhaven Drive, Lakeland, Florida, 33803.

FOS Records Committee annual report for 1982.—The FOS Records Committee was established in the fall of 1981 to review significant ornithological records from Florida.

The FOS bylaws state that the purpose of the Committee is to accept or reject sighting records, to promote the submission of unusual sightings that might otherwise remain unpublished, to encourage observers to provide ac-

curate details of unusual sightings, and to assure that all submissions are examined critically. Records to be reviewed include sightings of birds that are rare in Florida, within the AOU boundaries of the state, or those that represent significant deviations (temporal or spatial) from their usual occurrences.

Committee members and expiration dates of their terms are: Wally George 1982; Lucy R. Duncan 1983; Henry M. Stevenson 1983; Lyn S. Atherton 1984; Margaret C. Bowman, Sec. 1984.

Procedures for submitting data appeared in the FOS-FAS Newsletter vol. 7:3. Copies of the Documentary Form are available from Committee members or the Secretary at P.O. Box 1833, Vero Beach, FL 32960. A stamped legal size envelope is necessary. The submitter photocopies the form for immediate use and keeps the master. Submission of the FOS Documentary Form is not mandatory but recommended for uniformity. Reports, accompanied by any substantiating photos, drawings, pellets, tapes, or other evidence are permanently deposited at the Florida State Museum, Gainesville, Florida, and made available to qualified investigators. Records that are accepted by the Committee are published annually in the Florida Field Naturalist. The Committee also makes an annual report at the Fall FOS meeting, as stipulated in the bylaws. Reviews of the Committee are confidential. A unanimous vote is required for acceptance of a record. If new information arises, a decision may be reconsidered. All materials must be submitted to the Secretary of the Committee who will circulate them among the committee members.

Significant records published in American Birds and Florida Field Naturalist should be submitted to the Records Committee. The Editor of FFN sends to the Committee, prior to publishing, those manuscripts relating to birds that fall within the view of the Committee. Seasonal editors of American Birds are urged to submit records. The Committee members serve as technical referees advising the FFN editor on acceptability of papers based on distribution records. Only records approved by the Committee will be published in FFN.

During its first year the Committee received 26 reports of sightings, several of which were reported independently by more than one observer. Hence, there were more reports than birds. The more reports per sighting, the better the evidence available for consideration. Of the 20 birds reported, 10 (50%) were accepted (Table 1). Reports that were reviewed and not accepted generally lacked sufficient evidence. A good record cannot be damaged by too much detail nor by too many independent reports. Two reports were submitted and then withdrawn prior to review.

Contributors were Brooks Atherton, Lyn S. Atherton, Alan Barron, Frederick M. Barry, Ted Below, Jane M. Brooks, Robin Carter, James E. Cavanagh, Jr., Harriet Davidson, William E. Dowling, Lucy R. Duncan, Robert A. Duncan, Harlan B. Herbert, Larry Hopkins, E. Richard King, Claire Krusko, Barry Lenz, Jeffrey S. Moore, Martin T. Morris, Bruce D. Neville, Colleen R. O'Sullivan, Ellen Slater, Jim Stevenson, R. T. Walton.—**Margaret C. Bowman**, Records Committee Secretary, P.O. Box 1833, Vero Beach, Florida 32960.

Florida Field Naturalist 11: 42-44, 1983.

Table 1. FOS Records Committee annual report 1982.

Date of report	Species	Serial number	Date observed	Location	Decision
09/02/81	Townsend's Warbler	81-001	05/05/81	Pigeon Key Monroe Co.	Not Accepted
09/03/81	Mountain Plover	81-002	03/03/81	Bahia Honda Monroe Co.	Not Accepted
10/26/81	Northern Wheatear	81-003	10/20/81	Crossbar Ranch Pasco Co.	Not Accepted
10/27/81	Baird's Sandpiper	81-004	03/25/81	Lakeland Sewer Polk Co.	Accepted
11/11/81	Baird's Sandpiper photo	81-005	10/01-03 /81	Ft. Pickens Escambia Co.	Accepted
11/17/81	Sage Thrasher photos	81-006	03/06/81	Hickory Mound Taylor Co.	Accepted
12/10/81	Sabine's Gull photos	81-007	10/26-28 /81	Ft. Pierce St. Lucie Co.	Accepted
01/22/82	Brant photo	81-008	10/24,31 /81	Duda Farms Lake Co.	Accepted
03/10/82	Wied's Crested Flycatcher	82-009	12/17/81	Royal Palm Hammock, ENP	Accepted
03/24/82	Franklin's Gull field sketch	82-010	03/23/82	Pensacola Escambia Co.	*Accepted
04/10/82	Baird's Sandpiper	82-011	04/10/82	Old Keystone Rd., Pinellas Co.	Not Accepted
05/24/82	Harlequin Duck photos	82-012	04/02/82	Ft. Pickens Escambia Co.	Accepted
06/18/82	Red-footed Booby field sketches	82-013	05/08/82	Bush Key Dry Tortugas	Accepted
06/30/82	Common Eider photo	82-014	11/12/81	Doctor's Pass Collier Co.	Accepted
07/01/82	Kirtland's Warbler field sketch	82-015	08/01/81	Saddlebunch Key, Monroe Co.	Not Accepted
07/07/82	Bahama Swallow	82-016	06/02/82	Cudjoe Key Monroe Co.	Not Accepted
07/07/82	Black Noddy	82-017	06/06/82	Garden Key Dry Tortugas	Not Accepted
08/24/82	Zenaida Dove	82-018	05/18/79	Garden Key Dry Tortugas	Not Accepted
09/30/82	Yellow-green Vireo	82-019	09/22/82	Escambia Co.	Not Accepted
10/08/82	Northern Wheatear	82-020	09/21/82	St. George Is. Franklin Co.	Not Accepted

* occurrence now too regular to merit further review

FLORIDA FIELD NATURALIST

Quarterly publication of the Florida Ornithological Society

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Species index to Florida bird records in Audubon Field Notes and American Birds Volumes 1-30 1947-1976, by Margaret C. Bowman. xii + 42 pp. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00. Order prepaid from the Assistant to the Treasurer.

FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 11, NO. 2 MAY 1983 PAGES 25-44

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PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 11, NO. 3 AUGUST 1983 PAGES 45-68

BIRD CASUALTIES AT A CENTRAL FLORIDA POWER PLANT

DAVID S. MAEHR, A. GORDON SPRATT, AND DAVID K. VOIGTS

Florida Game and Fresh Water Fish Commission, Wildlife Research Laboratory, 4005 S. Main St., Gainesville, Florida 32601; A.G.S., Florida Game and Fresh Water Fish Commission, 1239 S.W. Tenth St., Ocala, Florida 32674; D.K.V., Florida Power Corporation, P.O. Box 14041, St. Petersburg, Florida 33733.

Bird mortality at lighthouses, bridges, power lines, radio and TV antennas, tall buildings, and smoke stacks is well documented. Weir (1976) and Avery et al. (1980) thoroughly reviewed bird kills at man-made obstacles, primarily in North America. Bird kills in Florida were summarized for communication towers in Leon County (Stoddard 1962, Stoddard and Norris 1967, Crawford 1974, 1981), Orange County (Kale 1971, Taylor and Anderson 1973, 1974), Ft. Pierce and Tallahassee (Kale 1971). Such losses of birds can provide information about migration patterns and influences of weather on migration. We discuss in this paper two instances of passerine mortality at the Crystal River Generating Facility, Citrus County, Florida.

METHODS

The Crystal River Generating Facility of the Florida Power Corporation is approximately 2.2 km E of the Gulf of Mexico and covers 1 540 hectares in central Citrus County, Florida. Two pairs of chimneys associated with separate fossil fuel generating units are 152 and 183 m tall. The shorter chimneys, which have been in operation since November 1969, are painted with alternating bands of red and white and have flashing red lights. The taller chimneys are unpainted and equipped with flashing white "strobe" lights. One of these stacks was completed during the spring of 1981. The other became operable during the summer of 1982. None of the smoke stacks are floodlighted.

We began collecting birds at 10 00 and continued until 16 00 on 23 September 1982. Birds were refrigerated after transport to the Wildlife Research Laboratory in Gainesville and identified the following day. On 24 September, we identified and estimated numbers of birds on the site after a second kill. Estimates of total kills on both nights were made by Florida Power Corpora-

tion employees when they removed birds from the site. Subsequent verification using conventional estimating methods was not possible. Weather data were obtained from the NOAA National Climate Center (Asheville, North Carolina) and from Florida Power Corporation weather records. All collected birds are deposited in the collection of the Florida State Museum, Gainesville, Florida. Scientific names of birds are in Table 1.

Results

On both nights, conditions near the facility were overcast to foggy with 0-16 kph winds out of the north and northeast. These conditions were apparently associated with a cold front that passed over central Florida on the night of 22 September 1982. No measurable rainfall fell on the nights of the casualties; however 3-5 cm fell on 22 September.

On 23 September 1982, 1 265 individuals from a kill estimated by Florida Power Corporation employees to be at least 3 000 birds were collected beneath the two pairs of chimneys. Twenty-nine passerine species were identified, the most abundant being the White-eyed Vireo (49%), Northern Parula (12%), Red-eyed Vireo (9%), Common Yellowthroat (7%), and Palm Warbler (5%) (Table 1). A systematic count was not possible on 24 September 1982; however, an estimated 2 000 birds were involved. Of 19 species identified on the 24th, the Gray Catbird (*Dumetella carolinensis*) and Prothonotary Warbler (*Protonotaria citrea*) were not represented in the 23 September collection. Estimated percentages for the 24th were White-eyed Vireo 60%, Red-eyed Vireo 30%, and Common Yellowthroat 5%. On both nights, the 183-meter tall stacks were associated with 95% of the mortality. A fan-shaped distribution of dead birds reflected the prevailing northerly winds.

Ring-billed Gulls (*Larus delawarensis*) were observed carrying bird carcases away from the facility and numerous "feather puddles" (Crawford 1974) and tracks of domestic cats (*Felis catus*) and raccoons (*Procyon lotor*) were observed. While predators and scavengers may have removed a number of birds from the facility, the removal of many more for safety and sanitary reasons greatly reduced the total available for collection.

Discussion

The mortality estimate of 3 000 birds may be one of the largest single night kills recorded for Florida (see Avise and Crawford 1981). Though most species found at the Crystal River Facility

TABLE 1. Bird casualties at the Crystal River Generating Facility, Florida Power Corporation, Cirtus County, Florida, on 23 September 1982.

Species	183-Stacks	152-Stacks
Empidonax spp.	15	
Veery (*Catharus fuscescens*)	1	
White-eyed Vireo (*Vireo griseus*)	595	35
Yellow-throated Vireo (*Vireo flavifrons*)	16	1
Red-eyed Vireo (*Vireo olivaceous*)	120	1
Tennessee Warbler (*Vermivora peregrina*)	2	
Northern Parula (*Parula americana*)	156	1
Yellow Warbler (*Dendroica petechia*)	1	
Chestnut-sided Warbler (*Dendroica pennsylvanica*)	7	
Magnolia Warbler (*Dendroica magnolia*)	18	
Black-throated Blue Warbler (*Dendroica caerulescens*)	1	
Black-throated Green Warbler (*Dendroica virens*)	1	
Blackburnian Warbler (*Dendroica fusca*)	4	
Yellow-throated Warbler (*Dendroica dominica*)	1	
Prairie Warbler (*Dendroica discolor*)	25	
Palm Warbler (*Dendroica palmarum*)	60	
Black-and-White Warbler (*Mniotilta varia*)	18	1
American Redstart (*Setophaga ruticilla*)	33	1
Worm-eating Warbler (*Helmitheros vermivorus*)	3	
Ovenbird (*Seiurus aurocapillus*)	11	1
Louisiana Waterthrush (*Seiurus motacilla*)	3	
Kentucky Warbler (*Oporornis formosus*)	5	
Connecticut Warbler (*Oporornis agilis*)	1	
Common Yellowthroat (*Geothlypis trichas*)	88	6
Hooded Warbler (*Wilsonia citrina*)	25	
Canada Warbler (*Wilsonia canadensis*)	1	
Yellow-breasted Chat (*Icteria virens*)	3	
Summer Tanager (*Piranga rubra*)	1	
Indigo Bunting (*Passerina cyanea*)	2	
Bobolink (*Dolichonyx oryzivorus*)	1	
TOTAL	1 218	47

were migrants expected in fall in Florida, a few were noteworthy. The Black-throated Green Warbler specimen is an early fall record, and the Connecticut Warbler is an unusual fall visitor with only one fall record reported by Crawford (1981). The 630 White-eyed Vireos collected exceeded by 112 the 25-year fall total killed at the Leon County site (Crawford 1981). If all bird casualties had been available for identification, this difference would have been much greater. An explanation for the high percentage of White-eyed Vireos found at the Crystal River Facility may be the reliance of this species on coastlines for navigation during migration,

making it more susceptible to collision with a coastal facility. Continued monitoring of the area for future kills may reveal other interesting patterns of Florida bird migration.

Most papers discussing bird mortality at man-made structures are generally thorough in reporting new records and other migration data. Few address the task of mitigating the huge annual loss of bird life caused by these structures. It is generally agreed (Weir 1976) that lighting appears to attract migrating birds under overcast conditions. Although we can not here directly address methods to prevent the continued mortality at man-made obstacles, the need to investigate alternatives of safe lighting should be stressed. Although 50 m shorter, only 5% of the mortality occurred at the red and white painted stacks with red lights. The reflecting qualities of the paint may have helped birds avoid impact after their initial attracton to lights, or red may have been a less alluring color. Any suggested cause and effect relationships, however, must be viewed with care. The heavy mortality at this strobe-lit facility is counter to findings of other studies. Taylor (1981) and Quilliam (1981) have suggested that strobe lights are less alluring to migrating birds than are colored lights. Another confounding factor was the well-lighted construction activity beneath the stacks with strobe lights. These lights, primarily incandescent, may have had some influence on the behavior of the birds involved. Because many factors can influence bird mortality at tall structures, further investigation is necessary to determine the exact causes of collisions.

A daily monitoring program was initiated by Florida Power Corporation immediately following these collisions at the Crystal River Generating Facility. In this way, valuable information on bird migration in this coastal situation can be accumulated and used to answer many of the questions about massive seasonal movements. Also, any changes in lighting conditions may be evaluated by noting changes in casualty rates.

Acknowledgments

We thank Florida Power Corporation officials for permission to collect birds at the Crystal River Facility. S. A. Nesbitt, A. E. Shapiro, J. A. Rodgers, and K. C. Wenner assisted in bird identifications and provided valuable suggestions on the manuscript. R. L. Crawford and H. W. Kale provided valuable insight into the bird-tower problem. Comments by J. A. Kushlan and W. K. Taylor improved the quality of the manuscript.

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REVIEW

Marine birds of the southeastern United States and Gulf of Mexico. Part I. Gaviiformes through Pelecaniformes.—R. B. Clapp, R. C. Banks, D. Morgan-Jones, and W. A. Hoffman 1982. U.S. Fish Wild. Serv., Off. Biol Serv. FWS/OBS-82/01, 637 pp. and **Marine birds of the southeastern United States and Gulf of Mexico. Part II. Anseriformes.**—R. B. Clapp, D. Morgan-Jones, and R. C. Banks 1982. P.S. Fish Wild. Serv., Off. Biol. Serv FWS/OBS-82/20, 491 pp. —These reports summarize the status of marine birds in the southeastern United States and explore the potential effects on these species of the development of petroleum resources on the outer continental shelf. Part I covers 39 species; Part II, 41. The authors can be justly proud of this comprehensive, virtually complete, summary of all available information on the species involved. An invaluable publication.—**Fred E. Lohrer,** Archbold Biological Station, Route 2, Box 180, Lake Placid, Florida 33853.

NOTES

Red-bellied Woodpeckers roosting outside of cavities.—Red-bellied Woodpeckers (*Melanerpes carolinus*), like most woodpeckers, typically roost and nest in cavities (Stickel 1964, Wilson Bull. 76: 382-383). Short (1978, Wilson Bull. 91: 16-28) suggested that year-round excavation of new cavities by picids indicates the selective advantage afforded by the safety of these sites. The following description of several Red-bellied Woodpeckers roosting together in cabbage palm trees (*Sabal palmetto*) at two sites on the Archbold Biological Station, 12 km S of Lake Placid, Highlands County, Florida, is the first report of the species regularly roosting outside of cavities.

From one to three unbanded Red-bellied Woodpeckers roosted among the lowermost living or dead fronds of a 10-m-high palm checked on nine occasions in January 1981 (1 male, 5 nights; 2 males, 1 night; 2 males and 1 female, 3 nights). Each bird roosted under a separate frond by clinging to the leaf midrib near the locus of palmation (Fig. 1). Beginning June 1981, adults were color banded and one pair of Red-bellied Woodpeckers was found to defend the area containing the palm. Both birds roosted in cavities in a nest tree from summer 1981 until April 1982 when the tree fell. On six days in May and June 1982, the male was found roosting in a newly excavated nest cavity. On three of these days, the female was found roosting in the palm.

A second site about 1.5 km away included four cabbage palms clustered in an area 20 m in diameter. Birds roosted in the one palm tree most isolated from the others and no physical differences were noted among the 4 trees. An adult roosted in the palm on 27 July 1981. On 23 September 1981 an adult female flew into the lowermost fronds but apparently failed to grasp a midrib and fell from the fronds. It then flew elsewhere to roost. Beginning November 1981, the site was checked once per week at dawn or before sundown, and two to four birds were observed roosting in the tree through March 1982. These included a pair, a male of a second pair, and a female of a third pair. The palms were on the boundary of the territories of the first and second pairs. The female of the third pair was never seen in the area except to roost. The birds flew to the roost site at different times and no conflicts were observed. The first bird leaving the palm in the morning seemed to stimulate the others to leave. In April 1982, the two males started roosting in newly excavated nest cavities. The female of the first pair continued to roost in the palm through June 1982 after which observations were discontinued. The male of the third pair disappeared in April 1982, and his mate was only seen in the study area during May and early June when roosting in the palm.

The palm-roosting habit of some Red-bellied Woopeckers at the two sites may have been the result of the shortage of cavities. Intraspecific interactions over cavities were observed between Red-bellied Woodpecker mates and between residents and transients. Interactions among Common Flickers (*Colaptes auratus*), Red-bellied, Red-headed (*M. erythrocephalus*), Downy (*Picoides pubescens*), and Hairy (*P. villosus*) Woodpeckers were also seen. Red-bellied Woodpeckers attempted to expel flying squirrels (*Glaucomys volans*) from cavities and were sometimes successful. However, they were not seen attempting to expel gray squirrels (*Sciurus carolinensis*). Screech Owls (*Otus asio*) were found in three former woodpecker cavities. Although Red-bellied Woodpeckers generally are not social (Kilham 1961, Wilson Bull. 73: 237-254), the presence

Fig. 1. Red-bellied Woodpecker roosting under the lowermost frond of a cabbage palm tree. Photo obtained with electronic flash 30 min after sunset and lens aimed 90° from the horizontal.

of a particularly favorable outside roost site may encourage its use by several individuals. The fronds of *Sabal palmetto*, which is found throughout Florida and coastal Georgia and South Carolina (Small 1972, Manual of the southeastern flora, New York, New York, Hafner Publishing Co.), apparently provide such a site; thus this palm species may be used commonly for roosting by Red-bellied Woodpeckers in areas where both occur and where cavities are scarce.

We thank L. L. Short, J. N. Layne, and F. E. Lohrer for comments on this note. Fieldwork was supported by a New York State University Fellowship and a grant from the Chapman Memorial Fund of the American Museum of Natural Histroy.—**Lilian J. Saul,** Department of Biology, Queens College, Flushing, New York 11367 (Present address: 14305 N. 22nd St., Lutz, Florida 33549) and **Douglas A. Wassmer,** Department of Biology, University of South Florida, Tampa, Florida 33620.

Florida Field Naturalist 11: 50-51, 1983.

The Common Eider in Florida.—On 12 November 1981 Pat Ware saw an eider swimming in the surf 250 m S of Doctors Pass, Naples, Collier County, Florida. On the same day I photographed the bird and identified it as an immature male Common Eider (*Somateria mollissima*). Its plumage closely resembled the plates in Palmer (1976) and Peterson (1980). The identification of the Common Eider was confirmed by H. M. Stevenson and P. W. Sykes, Jr. (pers. comm.), who examined photographs taken on 26 December 1981 (photograph # P341 Tall Timbers Research Station).

TABLE 1. Summary of Common Eider records in Florida.

Number	Date (day/mo./yr.)	Sex[1]	Location	Reference	Comment
1	15-16/12/55	NA	Lauderdale-by-the-sea, Broward, Co.	S. Sprunt *in* Stevenson 1956	Univ. Miami Ref. Col. # 1032 (R. Andrews, R. P. Allen)
2	14-15/12/57	NA	Tampa Bay, Hillsborough, Co.	Sprunt 1958	Details lacking.
3	19/12/62	Female	Ponce de Leon Inlet, Volusia, Co.	Ackermann 1963	Both observations are of a female in the same general area; probably the same bird.
	3-25/1/63	Female	Matanzas Inlet, St. Johns, Co.	Hudson 1963	
4	3/4/67	NA	Dry Tortugas, Monroe, Co.	C. Petrovic *in* Robertson 1967	Reported as the southernmost record for N. America (Petrovic and King 1972). Univ. Miami Ref. Col. 5246
5	17-27/12/70	NA	St. George Inlet, Duval, Co.	Markgraf 1971	One bird remaining at one location through midwinter.
	Late/11/70-4/2/71	NA	St. George Inlet, Duval, Co.	Markgraf et al. *in* Stevenson 1971	
6	23/11/72	NA	Melbourne, Brevard, Co.	F. Moore *in* Stevenson 1973	Four records appear to be of the same bird that died.
	4/12/72-2/2/73	NA	Cocoa, Brevard, Co.	R. Barber *in* Woolfenden 1973	
	10/7/73	NA	Canaveral, Brevard, Co.	Many observers *in* Ogden 1973	
	9/9/73	NA	Canaveral, Brevard, Co.	R. Barber *in* Edscorn 1974	

[1]NA = Not Available.

The duck remained in the vicinity until 13 February 1982 and was seen by many observers along approximately 10 km of moderately-used urban beach. The eider was tame and was easily photographed while it fed energetically in the surf wash by scooping up coquinas (*Donax variabilis*), an abundant small clam. Mollusks are known to be the predominant food of Common Eiders (Palmer 1976, Bent 1925). Photographs taken six weeks after its discovery showed the same individual. Although the feathers appeared worn, I believe that the eider was healthy and vigorous as was indicated by its feeding and its ability to fly well, which was observed by several persons.

My review of published records indicate that this sighting was the second record for the Gulf Coast. I have found 12 published records of the Common Eider elsewhere in Florida (Table 1). I believe these were of six individuals. In my opinion eight of the records involved three episodes of multiple sightings of the same bird. The Naples sighting would then be the seventh record for the state and the fourth time that one Common Eider has been reported in a restricted locale for at least 6 weeks. Except for three records, all of the eiders appeared in mid-winter (Table 1). These three records are of two individuals that probably arrived in winter and died. These data indicate that the occurence of the Common Eider in Florida is a winter phenomenon.

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Theodore H. Below, 3697 North Road, Naples, Florda 33942.

First record of Manx Shearwater for the Gulf Coast of Florida.—On 16 January 1981 Charles and Dorothy Brownold found a desiccated bird on the west end of Santa Rosa Island, Santa Rosa County, Florida. On 18 January Wayne Valentine of Gulf Islands National Seashore gave the bird to me to identify and submit to the Florida State Museum, where Dr. J. William Hardy confirmed my identification of the bird as a Manx Shearwater (*Puffinus puffinus*) and assigned it catalog number FSM 20622.

Although the Manx Shearwater occurs occasionally in winter on the Atlantic Coast of Florida, 2 specimens and 16 sight records (Wesley Biggs pers. comm.), there is no record for the Gulf Coast of Florida (Henry M. Stevenson and Herbert W. Kale, pers. comm.), Alabama (Imhof 1976, Alabama birds, University, Alabama, Univ. of Alabama Press), or Louisiana (Lowery 1974, Louisiana birds, Kingsport, Louisiana, Louisiana State Univ. Press). However, there are two records for Texas. A dead bird was discovered on North Padre Island in February 1975 (Webster 1975, Amer. Birds 29: 1006), and another specimen was picked up on Mustang Island near Port Aransas on 11 August 1980 (Webster 1981, Amer. Birds 35: 201). So the bird from Santa Rosa is the first record for the Gulf Coast of Florida and the third record of the Manx Shearwater for the entire Gulf Coast from Florida to Texas.—**H. P. Langridge,** 1421 W. Ocean Ave., Lantana, Florida 33462.

Florida Field Naturalist 11: 54, 1983.

In-place hopping of a feeding Little Blue Heron.— Little Blue Herons (*Egretta caerulea*) use a wide range of feeding behaviors (Kushlan 1978, Pp. 249-297 *in* Wading birds, Natl. Aud. Soc. Res. Reg. 7.) and a number of habitats in its search for food. The purpose of this note is to document an observation of a variation of the "hopping" behavior used by Little Blue Herons (Kushlan 1976, Auk 93: 86-94).

On 22 October 1981 I observed an adult Little Blue Heron at Ballast Point Park, Tampa Bay, Hillsborough Co., Florida, feeding by the "wade or walk slowly" method (Meyerriecks 1962, Nat. Hist. 71(6): 48-59) in approximately 7 cm of water adjacent to the shore in clear water on a substrate of mud and widely scattered rocks. I watched the bird feed for four minutes in this manner; strikes were infrequent (0.5 strikes/minute) and unsuccessful. Then the heron stopped, peered into the water, rose to an erect posture, and "hopped". The "hop" was achieved by slightly extending the wings, bending the legs at the heel joint, jumping with both feet together upwards until the feet were just at the surface of the water and slightly forward. On landing the heron peered into the water for several seconds. This behavior was repeated twice. No strikes were attempted while the heron was hopping or while peering into the water. Following the "hopping" sequence the heron left the area. The examination of the area by the Little Blue Heron following the "hops" suggested that the behavior was designed to disturb prey. I believe the "hop" was an attempt to locate food items in a previously unproductive area.

Kushlan (1976) described "hopping" as "a heron jumps into the air and flies a short distance to a potential prey item and often stabs simultaneously with landing." I have seen this type of "hopping" many times when Snowy Egrets (*Egretta thula*), Tricolored Herons (*Egretta tricolor*) and, occasionally, Little Blue Herons feed in shallow water. I consider it to be a disturb and chase or active pursuit method of feeding because the bird changes feeding locations.

Bagg and Eliot (1937, Birds of the Connecticut Valley in Massachusetts, Northampton, Massachusetts, Hampshire Bookshop) citing the observation of F. A. Stebbins and A. M. Bowen, stated that the Great Egret (*Casmerodius albus*) would "with the aid of his wings, hop straight up clear of the water and come down with stiff, spread toes, and then scrutinized the 'roil' he caused for dislodged prey." This behavior compares more closely with the behavior I observed, and I suggest the term "in-place hopping" rather than just "hopping" because the latter term implies a change of location.

I thank A. J. Meyerriecks, J. A. Kushlan, and D. F. Werschkul for comments on an earlier draft of this manuscript.—**Donald M. Kent**, Biology Department, University of South Florida, Tampa, Florida 33620.

Florida Field Naturalist 11: 54-55, 1983.

Unusual interaction between two buteos.—During the early afternoon of 2 January 1981 on Shell Island, Bay County, Florida, I observed an interaction between an immature Red-shouldered Hawk (*Buteo lineatus*) and an adult Red-tailed Hawk (*Buteo jamaicensis*). I had flushed the Red-tailed Hawk out of a patch of rushes (*Juncus roemerianus*) while I was walking the bay side of the island. Immediately after it flushed, an immature Red-shouldered Hawk, which had been perched on a nearby snag, attacked the larger bird from above. Both then flew out over the shallow waters of the bay to the north, where the Red-shouldered Hawk proceeded to strike the lower bird several times on the rump with its talons as they circled over the water. Then the red-shoulder left the red-tail and flew a short distance to the beach, where it picked up an oyster shell, flew back to a position over the redtail, and dropped the shell, which struck the back of the other buteo. The Red-tailed Hawk departed to the west, while the Red-shouldered Hawk returned to its former perch.

Although such use of an object to harass another bird seems not to have been previously reported, at least among raptors, related behavior has been documented. In 1977 a Ferruginous Hawk (*Buteo regalis*) is reported to have dropped a "5 x 7 x 10 cm stone" close to an observer of its nest (Blair 1981, Raptor Research 15:120). Blair concluded that the Ferruginous Hawk was using the stone in "defense of its nest." It might similarly be concluded that the interaction between the two buteos described above involved defense of winter territory, though the possibility that this action simply exhibits displacement activity cannot be ruled out completely.

Few other species of birds are known to carry oyster shells for any purpose whatsoever. One that does is the Herring Gull (*Larus argentatus*), which is widely known to drop these shells from the air onto a beach in order to obtain the edible portion of the shellfish (Terres, 1980, p. 460 in The Audubon Society encyclopedia of North American birds). Interestingly, numerous Herring Gulls frequented the area where the two buteos were seen and were observed dropping clam and oyster shells onto the beach. Whether or not their activity could have affected the redshoulder is problematic, but the possibility is present.

I wish to thank Stephen J. Stedman for comments and assistance with this note; I also thank Fred Lohrer, James Wiley, and James Kushlan for their contributions.—**Barbara H. Stedman**, Rt. 6, Pinewood Rd., Franklin, Tennessee 37064.

Florida Field Naturalist 11: 55, 1983.

Florida Scrub Jay steals Blue Jay eggs.—Many corvids, including Scrub Jays (*Aphelocoma coerulescens*), are widely known for eating eggs and young birds (Bendire 1895, Bent 1946), but published accounts of nest robbing are rare. Woolfenden (1974) reported evidence suggesting that Florida Scrub Jays occasionally eat eggs and nestlings of other Scrub Jays but did not actually witness such an incident. Specific causes of egg loss in jays are poorly known. Hilton and Vesall (1980) recorded 121 nesting attempts of Blue Jays (*Cyanocitta cristata*), of which 92 attempts terminated unsuccessfully before fledging. They witnessed only one actual case of "predation" in which a boy took his cat up a tree, and the cat knocked a clutch of eggs out of the nest. I report here a case of a Scrub Jay stealing eggs from a Blue Jay nest. The incident occurred on 10 May 1981 at Jonathan Dickinson State Park, Florida.

A Blue Jay nest was about 2 m high in a myrtle oak (*Quercus myrtifolia*) in sand pine scrub (Laessle 1942) dominated by 12-15 m tall sand pine (*Pinus clausa*). About 06 20 EST I saw a Scrub Jay hopping about in the clump of leaves surrounding the nest. A Blue Jay was perched on a branch about 1 m above the nest and made no effort to chase away the Scrub Jay. As I approached the nest, I could see another Blue Jay sitting in the nest. The second Blue Jay hopped off the nest and engaged the Scrub Jay in a physical battle in the nest tree. The two birds fought for about a minute, grappling beak-to-beak and foot-to-foot. For one period of several seconds, the Blue Jay was on top, wings and tail fully spread, holding the Scrub Jay down. At this point, the Scrub Jay began giving high-pitched distress calls, in apparent response to which at least four other Scrub Jays appeared. These four jays flew around within 5 m of the nest giving harsh scolding notes, but none of them came closer than 1 m from the nest. About a minute after the fight began, the two combatants stopped fighting, and the Blue Jay returned to its nest. The Scrub Jays remained in the area for a few more minutes, then gradually left. I examined the nest, causing the bird on the nest to leave, and found two eggs.

About 06 35, when I was away from the nest, two Scrub Jays returned to the vicinity of the nest but were apparently driven off by the Blue Jays. At 06 45 while I was still away from the nest, I heard the Blue Jays excitedly giving "jay" and "beetle" calls. I ran back to the nest and saw a Scrub Jay leaving it. The Scrub Jay dropped to the ground, picked up an object the size and color of a Blue Jay egg, and flew away. The Blue Jays continued to call excitedly. After 2-3 min, a Scrub Jay came back and hopped around the nest for several seconds while the Blue Jays called and dived at it a few times. The Scrub Jay then went to the nest, picked up a Blue Jay egg in its beak, and flew off. The Scrub Jay was silent during both of its trips to the nest, but the Blue Jays continued calling for several minutes after the Scrub Jay's last visit. I checked the nest at 07 05 and found it empty.

I may have contributed to the egg predation as I observed it by chasing the Blue Jay off the nest when I checked for eggs the first time. However, the Scrub Jay (or jays) clearly knew the location of the nest and visited the nest twice unsuccessfully before finally taking the eggs. One of the unsuccessful jay visits occurred after my first approach to the nest, so I clearly did not drive the Blue Jays completely away from the nest. I suspect that the Scrub Jay would have continued visiting the nest if I had not interfered and would have taken the eggs when an opportunity arose; certainly the inclination was there.

I thank J. W. Hardy, T. A. Webber, R. T. Paul, and an anonymous referee for their comments on the manuscript. These observations were made while I was conducting research for the Florida Game and Fresh Water Fish Commission.

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Jeffrey A. Cox, Florida State Museum and Department of Zoology, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist 11: 56-57, 1983.

Possible nocturnal migration of the Eastern Kingbird in the Florida panhandle.—Based on detailed notes on bird migration I have kept for over ten years, I consider the Eastern Kingbird (*Tyrannus tyrannus*) to be a common fall migrant in the Florida panhandle, often migrating westward in loose flocks of 30 to 80 birds along the coastal beaches and barrier islands. At Gulf Breeze, Santa Rosa County, they reach their peak numbers between the third week of August and the third week of September. The largest flock I have observed included 110 birds on 26 August 1982. The site of my observations in Gulf Breeze is 0.4 km from the end of a 32-km long peninsula extending westward into Pensacola Bay. A barrier island lies about 5 km south and the mainland 5 km north and west.

The Eastern Kingbird is usually considered to be a diurnal migrant. I have seen them move west in loose flocks along the treeless portion of Dauphin Island, Alabama in mid-day. Lowery (1974, Louisiana birds, Baton Rouge Louisiana, Louisiana State Univ. Press) has observed large southbound diurnal movements in August and September in inland Louisiana. Skutch (Bent 1963, Life histories of North American flycatchers, larks, swallows and their allies, New York, Dover Publications, Inc.), noted that it migrated by day in Central America, and he watched large flocks of southward bound migrants roost at night in Honduras. Diurnal migration is also strongly supported by a lack of nighttime casualties at the WCTV TV tower located 58 km inland near Tallahassee, Florida. Crawford's (1981, Bird casualties at a Leon County, Fla. TV tower: a 25-Year migration study, Bull. Tall Timbers Res. Sta. 22, Tallahassee, Florida) data show that in 25 years (1955-1980) only 13 fall casualties of Eastern Kingbirds were reported, many fewer than nocturnally migrating species, for instance 1066 Gray Catbirds (*Dumetella carolinensis*), 1018 Veeries (*Catharus fuscescens*), and 4600 Red-eyed Vireos (*Vireo olivaceus*).

At Gulf Breeze, I have often seen Eastern Kingbirds moving west in late afternoon toward the end of the point, where they aggregate, flying back and forth just above treetops. On 16 Sept. 1982, near sunset, I watched a flock of

60-65 milling about the point and finally disappearing into the trees near the end of the peninsula. The following morning at 10 minutes after sunrise, I could find only one bird. It is highly unlikely that their presence was obscured by trees. That afternoon, again near sunset, I watched a flock of 70-75 exhibit similar behavior. In order to be certain of ascertaining their location, I watched from the unobscured end of the thinly vegetated point from one half hour before sunrise the following morning until 08 00. I saw not a single Eastern Kingbird. Either they had resumed movement after dusk or begun their flight in the predawn hours. In any case, a total or partial nocturnal movement must have occurred.

My observations suggest that once reaching the coast, the Eastern Kingbird behaves as do other migrants when faced with a long over-water crossing and begins a nocturnal migration.—**Robert A. Duncan,** 614 Fairpoint Dr., Gulf Breeze, Florida 32561.

Florida Field Naturalist 11: 57-58. 1983.

REVIEW

Cape Sable Sparrow management plan.—James A. Kushlan, Oron L. Bass, Jr., Lloyd L. Loope, William B. Robertson, Jr., Peter C. Rosendahl, and Dale L. Taylor. 1982. South Florida Research Center Report M-660, 37 pp. Available from the authors, SFRC, Everglades National Park, P.O. Box 279, Homestead, FL 33030.—The last decade has seen a resurgence of interest in the Seaside Sparrow (*Ammodramus maritimus*). This seems paradoxical, as the species is a small, dingy songbird with nothing exceptional about its life style other than its habitat. Perhaps the sparrow has gained the attention of researchers because we now realize that estuaries are important to human welfare. But politics has also had something to do with it; several Seaside Sparrow populations are on federal or state endangered species lists. In Florida alone, six subspecies are classified as endangered, threatened, of special concern, or status unknown (Kale 1978). One of them, the Dusky Seaside Sparrow (*A. m. nigrescens*), became functionally extinct by 1980, the first federally-listed endangered form to disappear since the passage of the Endangered Species Act in 1973. The Dusky Seaside and the Cape Sable Seaside Sparrow (*A. m. mirabilis*) occur only in Florida and are geographically separate from the main Seaside Sparrow populations on the Gulf and Atlantic coasts. The Cape Sable Seaside Sparrow is the most isolated population, located about 300 km south of other Seaside Sparrows, which are on the central Florida Gulf coast.

The management plan for the Cape Sable Seaside Sparrow, prepared by biologists of the South Florida Research Center of the Everglades National Park, is scholarly. It should serve as a model for all such government documents. The authors have integrated a lot of information about Seaside Sparrow biology to provide a good background for the management of this population.

Like all Seaside Sparrows, the Cape Sable's life is intimately tied to water. But its waters are fresher than those of other populations. Also unlike other Seaside Sparrows, its habitat is a fire disclimax. The interactions of fire and water make the management of the sparrow interesting but complicated. The preferred habitat (as defined by highest densities of singing males) is grassland that burns periodically. The object of management is to burn the nesting areas about every five years on dense *Muhlenbergia* prairie and about every

8-10 years at less densely vegetated sites. The authors recommend that burning be done in the wet season (August-November) and should not cover more than 8-10% of a given population's habitat each year. This latter procedure assures that displaced residents will have nearby nest sites the next spring.

The management plan overlooks that not enough is known about the biology of the Cape Sable Seaside Sparrow. During 1970-1975 Harold Werner began ecological studies of the sparrow. His work formed the basis of a governmental report (Werner 1975) and a Master's Thesis (Werner 1976). If this work had continued, as Werner had originally planned, our knowledge of the Cape Sable Seaside would be much greater. To fill in the gaps of our knowledge, the authors extrapolate from what is known about other populations of the Seaside Sparrow. However, extrapolation may be dangerous; some facets of the Cape Sable's biology uncovered by Werner suggest that it may be anomalous among the Seaside Sparrows. For example, adult males (and presumably, females) have a very high annual survival, about 90%. At the same time the Cape Sable's nesting success (number of eggs producing fledglings), is about 62%, also high for a ground-nesting species. Why is the population not expanding? Another anomaly is the Cape Sable's clutch size. Seaside Sparrows in northern Florida have a median clutch size of three, while that of the Cape Sable is four, a reversal of the usual southward trend toward clutch reduction. Does the large clutch mean that winter mortality is relatively more important for the Cape Sable Seaside than for other Seaside Sparrow populations (see Ricklefs 1980)? We have no information on the winter ecology of the Cape Sable Seaside.

Our disastrous encounters with the Dusky Seaside Sparrow tell us that we must find out a great deal about rare animals before they reach the critical level of non-replacement. The Dusky Seaside went before anyone had a chance to delve deeply into its life history. Was it just another Seaside Sparrow, and if so, why did it disappear? Like the Cape Sable Seaside, it occupied some non-littoral habitats. Other races of the Seaside Sparrow live exclusively in tidal marshes. This difference should alert biologists to look for departures from rather than similarities to the general Seaside Sparrow pattern. For this reason, I am uneasy about this report's tendency to emphasize similarities with the other races, to the extent that this may obfuscate gaps in our knowledge. These possibly unique aspects of its life history could be critical to proper management.

A final point is that, in spite of its thoroughness, the plan could be a little more innovative. I was surprised that captive rearing was not mentioned as a management tool, especially since Seaside Sparrows are easily bred in confinement (Post and Antonio 1981). A secure captive group would be a hedge against destruction of the wild population by a catastrophe like a hurricane. Also, captive-reared birds could be used to reestablish the sparrows in their former range, such as on Cape Sable itself.

With two large, separate populations of the Cape Sable Seaside (one in southern Big Cypress, with about 2900 birds; the other in Taylor Slough, with about 2350 birds) under the jurisdiction of the National Park Service, the future of this bird seems secure. However, the concern exemplified by this excellent management plan must be continued. Because of human population pressure in south Florida, the habitat of this sparrow is an ecologically embattled frontier.

Literature Cited

Kale, H. W. II. 1978. Rare and endangered biota of Florida. vol. 2. Birds. Gainesville, Florida, Univ. Florida Presses.

Post, W., and F. B. Antonio. 1981. Breeding and rearing of Seaside-sparrow *Ammospiza maritima* in captivity. Int. Zoo Yearbook 21: 123-128.

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Werner, H. W. 1975. The biology of the Cape Sable Sparrow. Report to U. S. Fish Wild. Serv., Homestead, Florida, Everglades National Park.

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William Post, the Charleston Museum, 360 Meeting Street, Charleston, South Carolina 29403.

Florida Field Naturalist 11: 58-60. 1983.

REPORTS

Summary of the 1983 spring meeting.—The annual meeting of the Florida Ornithological Society, 15-17 April 1983, coincided with a front bringing birds in abundance to Gulf Breeze, Florida. Lucy and Bob Duncan and the Francis M. Weston Audubon Society were hosts. Jim Kushlan, Editor of the FFN, gave a status report on the journal, including a preview of the next year's issues. He requests that members publish their data, especially that on distribution and rarities, in the FFN. Associate editors Bill Robertson and Oron Bass are available to help authors with the technical details of writing a note or paper. Bill Courser will represent the FOS on the organizational committee of the Breeding Bird Atlas. The following slate, submitted by Herb Kale in the absence of Bob Loftin, Chairman of the nominating committee, was unanimously elected: Barbara C. Kittleson, President; Fred E. Lohrer, Vice President; Caroline H. Coleman, Treasurer; Marsha S. Winegarner, Secretary; and board members Helen Dowling, Annette Stedman, and Sheila Mahoney.

Todd Engstrom, FSU, spoke on "Seasonal patterns of habitat use by bird populations in northern Florida", and Dr. Frances James, FSU, spoke on "The environmental component of geographic variation in size and shape: experiments with Red-winged Blackbirds." Theodore Parker of LSU Museum of Zoology, our dinner speaker, spoke on "Ornithological expeditions in the Andes of Peru." The skin quiz, provided by Mary Clench and Bill Hardy, was won by Wes Biggs. Ted Below, outgoing president, thanked the board and membership saying that an interested and cooperative membership makes the organization a success and encouraging the members to stay in communication with board members.

The fall 1983 meeting will be held in Jacksonville, 14-16 October, with Duval Audubon Society as hosts, Bob Loftin, Local Chairman. St. Petersburg Audubon Society has invited FOS for 20-22 April 1984, with Dave Goodwin as Local Chairman.—**Barbara C. Kittleson,** 5334 Woodhaven Lane, Lakeland, Florida 33803.

FLORIDA ORNITHOLOGICAL SOCIETY, INC.
TREASURER'S REPORT, 1982

TOTAL FUND BALANCE, cash in banks at year-end

1981		1982	
Checking account	$1,212.92	Checking account	$ 7,072.32
Passbook savings	3,399.08	Research certificate	1,341.65
Certificate of deposit	2,627.51	Capital certificate	2,184.16
	$7,239.51		$10,598.13

1982 CASH RECEIPTS AND DISBURSEMENTS

TOTAL FUND BALANCE, 1 January 1982 ..... $ 7,239.51

Cash Receipts		*Cash Disbursements*	
Membership dues	$4,800.50	Membership	$ 149.48
Meetings	3,539.36	Meetings	2,524.00
FFN	72.00	FFN	2,595.63
Interest	647.23	Special publication	6.25
Special publication fund	125.00	Special projects	169.07
Research fund	127.00	Operating	456.53
Special projects	169.25	Newsletter	220.76
	$9,480.34		$ 6,121.72

TOTAL FUND BALANCE, 31 December 1982 ..... $10,598.13

ACTUAL INCOME AVAILABLE FOR USE DURING 1982

TOTAL CASH RECEIPTS		$ 9,480.34
Add 1982 dues received before 1/1/82	1,983.00	
Less 1983 & 1984 dues received before 1/1/83	2,080.00	
Less Research Fund receipts, 1982	315.64	
Less Special Pubication Fund receipts, 1982	400.00	
Less 1982 FFN Vol. 10:4 (payment made in 1983)	967.05	
ACTUAL INCOME, 1982		7,700.65
CASH DISBURSEMENTS, 1982		6,121.72
EXCESS OF INCOME OVER DISBURSEMENTS		$ 1,578.93

15 March, 1982.—**Caroline H. Coleman,** Treasurer, 1701 NW 24th St., Gainesville, Florida 32605.

FLORIDA BIRDS IN THE PERIODICAL LITERATURE

FRED E. LOHRER

Archbold Biological Station, Route 2, Box 180, Lake Placid, Florida 33852

AKEY, B. L., J. K. NAYAR, AND D. J. FORRESTER. 1981. Avian pox in Florida Wild Turkeys: *Culex nigripalpus* and *Wyeomia vanduzeei* as experimental vectors. J. Wild. Dis. 17: 597-599.

ALDRICH, J. W. 1981. Geographic variation in White-winged Doves with reference to possible sources of new Florida population. Proc. Biol. Soc. Wash. 94: 641-651.—With so much overlap and lack of agreement in size and color characters between White-wing populations in the Gulf of Mexico-West Indies region, all these populations are considered as belonging to one subspecific taxon *Zenaida a. asiatica.* Southern Florida specimens most closely resemble samples from Hisponiola and Cuba and the author suggests that the Florida population may have originated in either of these two islands and reached Florida in avicultural trade through Tampico. Natural range expansion from Cuba is also possible.

ATKINSON, R. D., T. S. BASKETT, AND K. C. SADLER. 1982. Population dynamics of Mourning Doves banded in Missouri. U.S. Fish Wild. Serv., Spec. Sci. Rept.-Wild. No. 250: 1-20.—Includes Florida recoveries.

BARBOUR, D. B., AND A. R. DEGANGE. 1982. Communal roosting in wintering Hooded Mergansers. J. Field Ornithol. 53: 279-280.—Pasco Co.

BARBOUR, D. B., AND A. R. DEGANGE. 1982. Reciprocal allopreening in the Brown-headed Nuthatch. Auk 99: 171.—Marion Co.

BASHAM, B. 1982. Plantation Report: the 1982 ABA Convention. Birding 14: 129-135.—Report of the 10-17 May 1982 American Birding Association annual meeting in southern Florida.

BESKE, A. E. 1982. Local migratory movements of radio-tagged juvenile harriers. Raptor Res. 16: 39-53.—A nestling Northern Harrier banded in Buena Vista Marsh, Central Wisconsin, was recorded in February of its first winter in southeastern Florida (probably Palm Beach Co.).

BLACK, B. B., AND L. D. HARRIS. 1981. Winter foraging patterns of Gulf coast Black Skimmers. Colonial Waterbirds 4: 187-193.—Near Cedar Key, 1979-1980.

BLACK, B. B., AND M. W. COLLOPY. 1982. Nocturnal activity of Great Blue Herons in a north Florida salt marsh. J. Field Ornithol. 53: 403-406.—At Cedar Key tidal flats.

BUHRMAN, C. B. 1982. The Florida that birders need. Birding 14: 137-139.—This brief article lists the major bird species that Florida visitors seek; the pitfalls and pests of Florida birding; and 5 current research projects that birders can contribute sightings to.

CAPRIO, A., AND D. L. TAYLOR. 1982. Breeding bird census. No. 87. Cutover subtropical slash pine forest. Amer. Birds 36: 74.—Everglades National Park, Dade Co.

CAPRIO, A., D. L. TAYLOR, M. BRITTEN, AND R. ROCHEFORT. 1982. Breeding bird census. No. 88. Virgin subtropical slash pine forest—February burn. Amer. Birds 36: 74.—Big Cypress National Preserve, (BCNP) Collier Co.

Caprio, A., D. L. Taylor, M. Britten, and R. Rochefort. 1982. Breeding bird census. No. 89. Virgin subtropical slash pine forest—December burn. Amer. Birds 36: 74-75.—BCNP, Collier Co.

Caprio, A., D. L. Taylor, M. Britten, and R. Rochefort. 1982. Breeding bird census. No. 90. Virgin subtropical slash pine forest—Summer burn. Amer. Birds 36: 75.—BCNP, Collier Co.

Caprio, A., D. L. Taylor, M. Britten, and R. Rochefort. 1982. Breeding Bird census. No. 91. Virgin subtropical slash pine forest—unburned control. Amer. Birds 36: 75.—BCNP, Collier Co.

Clapp, R. B., M. K. Klimkiewicz, and J. H. Kennard. 1982. Longevity records of North American birds: Gaviidae through Alcidae. J. Field Ornithol. 53: 81-124.—A Laysan Albatross holds the record for the oldest N. A. bird, 37+ years (or 39-02), but a Dry Tortugas Sooty Tern is close at 32 years. Other Florida records are Brown Pelican, 19-08 (years, months); Double-crested Cormorant, 17-08; White Ibis, 16-04; Black Skimmer, 20-00.

Clapp, R. B., R. C. Banks, D. Morgan-Jones, and W. A. Hoffman. 1982. Marine birds of the southeastern United States and Gulf of Mexico. Part I. Gaviiformes through Pelecaniformes. U.S. Fish Wild. Serv., Off. Biol. Serv. FWS/OBS-82/01, 637 pp.

Clapp, R. B., D. Morgan-Jones, and R. C. Banks. 1982. Marine birds of the southeastern United States and Gulf of Mexico. Part II. Anseriformes. U.S. Fish Wild. Serv., Off. Biol. Serv. FWS/OBS-82/20, 491 pp.

Clark, F. S. 1982. Florida, Kissimmee, Sandhill Crane, Limpkin. Birding 14: 128(u-v).—A birding-site, tear-out sheet to a site on Reedy Creek and on Lake Tohopekaliga, both fairly close to Orlando.

Conti, J. A., and D. J. Forrester. 1981. Interrelationships of parasites of White-winged Doves and Mourning Doves in Florida. J. Wild. Mgmt. 17: 529-536.—Mourning Doves from Alachua and Dade cos. compared with White-wings from Dade Co.

Dolbeer, R. A. 1982. Migration patterns for age and sex classes of blackbirds and starlings. J. Field Ornithol. 53: 28-46.—One or more Red-winged Blackbirds banded in Detroit area was recovered in northern Florida.

Duncan, C. D. 1982. Western Gull in Alabama and northwestern Florida. Amer. Birds 36: 899-902.—A one-legged gull first sighted 24 October 1977 at Mobile Bay and identified as a Lesser Black-backed Gull has been subsequently seen in 1978 and in 1981 in Fort Pickens, Florida, and reidentified as a Western Gull.

Dunks, J. H., R. E. Tomlinson, H. M. Reeves, D. D. Dolton, C. E. Braun, and T. P. Zapatka. 1982. Migration, harvest, and population dynamics of Mourning Doves banded in the Central Management Unit, 1967-77. U.S. Fish Wild. Serv., Spec. Sci. Rept. Wild. No 249: 1-128.—The CMU includes 14 states from the Rockies to the Mississippi River. Several tables include state of origin for birds recovered in Florida.

Elowson-Haley, A. M. 1982. Osprey spreads wings after fishing. Wilson Bull. 94: 366-368.—As observed in Everglades National Park, Dade Co.

Engstrom, T. 1982. Breeding bird census. No. 31. Mature beech-magnolia forest. Amer. Birds 36: 61.—Tall Timbers Res. Sta., Leon Co.

Erwin, R. M. 1981. Censusing wading bird colonies: An update on the "flight-line" count method. Colonial Waterbirds 4: 91-95.—Based primarily on ten colonies of Cattle Egrets, Louisiana Herons, Snowy Egrets, and/or Little Blue Herons studied in south-central Florida during Spring 1980.

Evans, D. L. 1982. Status reports on twelve raptors. U.S. Fish Wild. Serv., Spec. Sci. Rept.-Wild. 238: 1-68.—Distribution, ecology, management and status; compiled largely from the Literature through mid-1977 with some update through 1979. Nine of the 12 species occur regularly in Florida; Bald Eagle, Burrowing Owl, Caracara, Cooper's Hawk, Marsh Hawk, Merlin, Osprey, Peregrine Falcon, Sharp-shinned Hawk. However, only the Caracara and the Burrowing Owl accounts contain much information about Florida populations.

Fickett, S. B. Jr., and S. Nesbitt. 1982. Bald Eagle surveys in Florida. ENFO 82-3: 4-5.

Fisher, R. P. 1982. An albinistic Brown Pelican. Fla. Nat. 55(5): 7-10.—Includes 2 cover photos. At New Smyrna Beach. Same bird as in *FFN* 7: 6.

Fitzpatrick, J. W., and G. E. Woolfenden. 1981. Demography is a cornerstone of Sociobiology. Auk 98: 406-407.—A commentary based on Scrub Jay studies conducted at Archbold Biol. Sta., Highlands Co.

Forrester, D. J. 1980. Haematozoa and mallophaga from the White Ibis, *Eudocimus albus* L. in Florida. J. Parasitol. 66: 58.

Forrester, D. J., and P. P. Humphrey. 1981. Susceptibility of the knot (*Calidris canutus*) to *Plasmodium hermani*. J. Parasitol. 67: 747-748.—Study based on knots from the St. Petersburg area.

Forrester, D. J., P. R. Humphrey, S. R. Telford, Jr., and L. E. Williams, Jr. 1980. Effects of blood-induced infections of *Plasmodium hermani* on domestic and wild Turkey poults. J. Wild. Dis. 16: 237-244.—Wild Turkeys from Glades Co.

Fritts, T. H., and R. P. Reynolds. 1981. Pilot studies of the marine mammals, birds, and turtles in the OCS areas of the Gulf of Mexico. U.S. Fish. Wild. Serv., Office Biol. Ser. FWS/OBS-81/36, 139 pp.—Results of aerial surveys in 2 areas off Florida during August and November 1979.

Gee, G. F., J. W. Carpenter, and G. L. Hensler. 1981. Species differences in hematological values of captive cranes, geese, raptors, and quail. J. Wild. Mgmt. 45. 463-483.—Includes values for Florida Sandhill Cranes.

Good, J. M. 1982. Winter bird population study. No. 9. Slash pine. Amer. Birds 36: 31. Everglades Natl. Park, Dade Co.

Good, J. M. 1982. Winter bird population study. No. 51. Canal bank and associated spoil bank. Amer. Birds 36: 41.—2 km N of Homestead, Dade Co.

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Greiner, E. C., D. J. Black, and W. O. Iverson. 1981. *Plasmodium* in a Bald Eagle (*Haliaeetus leucocephalus*) in Florida. J. Wild. Dis. 17: 555-558.—Adult eagle found injured along north-central Florida road.

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Hardy, J. W., and M. H. Clench. 1982. First United States specimen of the White-collared Swift. Amer. Birds 36: 139-141.—Found dead, clinging to a screen door of a condominium on Perdido Key, 15 km W of Pensacola, Escambia Co., on 25 January 1981. Specimen to FSM.

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Harrington, B. A., D. C. Twichell, and L. E. Leddy. 1982. Knots in Florida-A migration mystery. Fla. Nat. 55(5): 4-5.—Portions of this paper delivered at 1981 fall FOS meeting.

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Hennemann, III, Willard W. Energetics and spread-winged behavior of Anhingas in Florida. Condor 84: 91-96.—Studies of four hand-reared captives conducted at Gainesville and presumably collected somewhere in Florida.

Holler, N. R., and E. W. Schafer, Jr. 1982. Potential secondary hazards of avitrol baits to Sharp-shinned Hawks and American Kestrels. J. Wild. Mgmt. 46: 457-462.—Sharp-shins collected near Gainesville, Alachua Co., Nov. and Dec. 1979.

Kale, H. W., II, and R. W. Loftin. 1982. A longevity record for the Black Skimmer. N. A. Bird Bander 7: 54.—Banded in Georgia by Kale, recovered near Mayport by Loftin, age 20+ years. See Clapp et al. above.

Kenner, K. C., and W. R. Marion. 1981. Wood Duck production on a northern Florida phosphate mine. J. Wild. Mgmt. 45: 1037-1042.—Hamilton Co.

Kilham, L. 1982. Florida Red-shouldered Hawk robs American Crows. Wilson Bull. 94: 566-567.—Highlands Co.

Kilham, L. 1982. Cleaning/feeding symbioses of Common Crows with cattle and feral hogs. J. Field Ornithol. 53: 275-276.—Highlands Co.

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Kushlan, J. A., and L. C. McEwan. 1982. Nesting phenology of the Double-crested Cormorant. Wilson Bull. 94: 201-206.—In southern Florida.

Kushlan, J. A., O. L. Bass, Jr., and L. C. McEwan. 1982. Wintering waterfowl in the Everglades estuaries. Amer. Birds 36: 815-819.

Larson, S. E. 1982. Winter population trends in the Cattle Egret. Amer. Birds 36: 354-357.—A considerable portion of the discussion considers Florida.

Layne, J. N. 1982. Status of sibling aggression in Florida Sandhill Cranes. J. Field Ornithol. 53: 272-274.—In 10 south-central Florida counties.

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Leberman, R. C. 1982. Powdermill Nature Reserve-1980 recoveries. N. A. Bird Bander 7: 53.—Two birds banded at Powdermill NR (of Carnegie Museum of Natural History) in western Pennsylvania were recovered in Florida: An American Robin found dead 17 January 1980, St. Petersburg, age 2 yrs., 7 mo; A Yellow-rumped Warbler found dead 15 January 1980, St. Cloud, age less than 1 year.

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Leenhouts, W. P. 1982. Breeding bird census. No. 187. Cordgrass salt marsh II Amer. Birds 36: 99-100.—St. Johns River valley, Brevard Co.

Leenhouts, W. P., and J. L. Baker. 1982. Vegetational dynamics in Dusky Seaside Sparrow habitat on Merritt Island National Wildlife Refuge. Wild. Soc. Bull. 10: 127-132.—Brevard Co.

Loflin, R. K. 1982. Ani male apparently killed by other anis while attempting to parasitize nest. Auk 99: 787-788.—At Virginia Key, Dade Co.

Lovvern, J. R., and C. M. Kirkpatrick. 1982. Fall census of Eastern Greater Sandhill Cranes. Pp. 259-265 *in* Lewis, J. C. (ed.), Proc. 1981 Crane Workshop, Natl. Aud. Soc., Tavernier, FL.—The results of the 1979 and 1980 census include some Florida data.

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Mager, D. 1982. Notes on eagle nesting in Florida. ENFO 82-3: 6-7.

Marion, W. R., and T. E. O'Meara. 1982. Limpkins. P 75 in Davis, D. E. (ed.), CRC Handbook of census methods for terrestrial vertebrates. CRC Press, Boca Raton, FL.—Techniques perfected in Florida.

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Marion, W. R., T. E. O'Meara, and D. S. Maehr. 1981. Use of playback recordings in sampling elusive or secretive birds. Stud. Avian Biol. 6: 81-85.—King and Virginia rails and Soras in phosphate mines in Hamilton Co.; Limpkins on Lake Ocklawaha, Marion and Putnam co.; Plain Chachalacas in Texas.

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Murphy, W. L. 1982. The Ash-throated Flycatcher in the East: an overview. Amer. Birds 36: 241-247.—Florida information includes an account of a Virginia Key, Dade Co., sighting (20 January 1980), and a listing of the three previous Florida records.

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Nesbitt, S. A. 1982. The past, present, and future of the Whooping Crane in Florida. Pp. 151-154 *in* Lewis, J. C. (ed.), Proc. 1981 Crane Workshop, Natl. Aud. Soc., Tavernier, FL.

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Poole, A. 1982. Brood reduction in temperate and sub-tropical Ospreys. Oecologia 53: 111-119.—Florida Bay and Long Island, N.Y.

Post, W., and F. B. Antonio. 1981. Breeding and rearing of Seaside Sparrows *Ammospiza maritima* in captivity. Int. Zoo. Yearbook 21: 123-128.—6 hand-reared nestlings and 19 wild-caught adult *A. m. peninsulae* from Cedar Keys and 3 adult male *A. m. nigrescens* were bred.

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FLORIDA FIELD NATURALIST

Quarterly publication of the Florida Ornithological Society

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FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Birds

SMITHSONIAN
1984

SPECIAL ISSUE: The Snail Kite in Florida

FLORIDA ORNITHOLOGICAL SOCIETY

FOUNDED 1972

ISSN 0738-999X

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The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 11, NO. 4 NOVEMBER 1983 PAGES 69-120

THE EVERGLADE KITE

DEAN AMADON

American Museum of Natural History, Central Park West at 79th St., New York, New York 10024

Two species of snail-eating kites, both of wide distribution in the warmer parts of the New World, find their northern limits in the southern United States. One is the Snail or Everglade Kite (*Rostrhamus sociabilis*), long recognized as a Florida specialty by ornithologists and bird-watchers; the second is the Hook-billed Kite (*Chondrohierax uncinatus*), a recent arrival in southernmost Texas. The Snail Kite specializes on large fresh-water snails; the Hook-billed uses its coarser beak to extract flesh from land snails.

Although the Snail Kite is common or even abundant in parts of its range—Don Eckelberry and I once counted over 200 in sight at one time in a vast marsh in Argentina—the Florida population has long suffered from human onslaughts upon the wetlands of that state and is currently on the endangered species roster. Probably completely isolated from other segments of the species and in many ways our most specialized raptor, it deserves such status. Further, the Snail Kite prospers as Florida's wetlands prosper and serves as an indicator species in a state where the vast demands of the Miami strip and other areas are threatening what once seemed to be the best watered section of eastern United States.

A glaucous or leaden bloom sets off the black plumage of the male Snail Kite (Fig. 1, 2). Robert Ridgway thought this is more pronounced in the Florida population and a century ago gave it the subspecific name *plumbeus*. Dr. Herbert Friedmann, Ridgway's successor as curator of birds at the Smithsonian, noticed that this bloom disappears from the plumage in time, or even during the process of preparing a speciman. He concluded that this kite shows no geographical variation in color throughout its vast range. Accepting this conclusion, there remain only rather trivial variations

Fig. 1. Male Snail Kite. Photography courtesy of Paul W. Sykes, Jr., U.S. Fish and Wildlife Service.

in size. South American Snail Kites are a little smaller and represent *Rostrhamus sociabilis sociabilis*. Those of Florida are larger and the name *plumbeus* may be retained for them. Finally the population of eastern Mexico—Veracruz and thereabouts—have unusually large bills. In the preliminary studies for their proposed "Birds of Mexico" (which never saw the light of day) Nelson and Goldman noticed this and named them *R. s. major*. Perhaps the snails upon which they feed are larger in that area?

Fig. 2. Female Snail Kite. Photograph courtesy of Paul W. Sykes, Jr., U.S. Fish and Wildlife Service.

Dr. Friedmann in the mentioned review, which he did while writing the volume on Falconiformes for the continuation of Ridgway's "Birds of North and Middle America", noticed slight differences in size and proportions in the Snail Kites of Cuba and the Isle of Pines and named them *R. s. levis*. Although few specimens from Cuba are available anywhere, I later decided that by present standards the Cuban birds are not separable from those of Florida and that the name *plumbeus* should apply to both. But, to repeat, this should not

affect the status of the Florida kites as endangered; all appropriate measures should be taken to insure their survival.

The wording of the Endangered Species Act recognizes that policy should not be dictated by sometimes varying opinions as to the taxonomic status of an organism; opinions which may extend even to the species level—for example is the Florida Scrub Jay a race of the western one or a species? Populations may be designated as endangered regardless of their taxonomic rank.

This policy must be implemented carefully and has already engendered some opposition. The commonest of birds may be endangered locally if the environment is being altered; sometimes the alteration may be natural such as the progression from brush to woodland following a lightning-caused fire. Nor should the subspecies criterion be pushed too far. We heard much about the "Southern" Bald Eagle being endangered, but it differs from the "Northern" Bald Eagle only in averaging slightly smaller and since the southern eagles, or some of them, wander north in summer and the northern ones south in winter, the situation is further confused. But as with the Snail Kite this does not mean that the eagle should be denied protection and management in the very extensive portions of its range where it has been nearly or quite extirpated as a breeding bird.

Nor can one avoid purely subjective considerations. We are more interested in saving the Whooping Crane or Bachman's Warbler than the virus of smallpox, though a case has been made even for the last. Given the world's political fragmentation, each country has to look first to its own wildlife heritage; the Everglade Kite, to revert for a moment to its old name, is certainly a remarkable, indeed unique element in that of the United States; may it always remain so.

SNAIL KITE USE OF THE FRESHWATER MARSHES OF SOUTH FLORIDA

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Although the Snail Kite (*Rostrhamus sociabilis plumbeus*) once ranged widely throughout the freshwater marshes of Florida (Howell 1932), in recent years habitat loss and modification have greatly reduced the species' range (Sprunt 1945, 1947, 1950, Stieglitz and Thompson 1967, Sykes 1978, 1979). Kites in Florida were restricted principally to the headwaters of the St. Johns River, the Savannas, Lake Okeechobee, Loxahatchee Slough, and the Everglades from 1967 through 1980, although other areas were used for short periods. In this paper I describe the area, and habitats used by kites between 1967 and 1980 and discuss their importance to maintenance of the kite population.

METHODS

Freshwater marshes of southern Florida (south of 28° N Latitude) were visited and the presence of Snail Kites observed each year from 1967 through 1980, and standardized censuses were conducted annually in November and December 1969 through 1980, by methods explained elsewhere (Sykes 1979, 1982). I also used observations of contributors. I did not include in this report sightings of transient birds outside their principal use areas. Small marshes in the northern half of the Florida peninsula and in the Big Cypress Region of Collier County have not been included because of incomplete data. I determined the extent of marsh habitat, past and present, from published sources and field investigations. I plotted former and extant marshes on Florida Department of Transportation general highway maps for the counties (scale 1:126720) and on U.S. Geological Survey maps (1:24000). I measured the areas plotted twice with a compensating polar planimeter and averaged the readings. The habitats are shown in detail in Sykes (1984). Water levels discussed for Lake Kissimmee, Lake Okeechobee, and the Everglades Region were obtained from the "Monthly report of operations" of the U.S. Army Corps of Engineers, Jacksonville District, Florida, and I measured water depths at selected sites.

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Florida Field Naturalist 11: 73-88, 1983.

Study Areas

Lake Kissimmee is a shallow central Florida lake halfway between Orlando and Lake Okeechobee with the channelized Kissimmee River passing through it. Narrow marshes bordering most of the east, north, and northwest sides were used by kites. A few small marshes are also scattered along the west side. The manipulated water level ranges widely from 12 to 16 m mean sea level (msl), drying the marsh for long periods in some years and flooding it deeply in others.

The St. Johns River in eastern Florida drains north through a series of shallow lakes. The headwaters is a broad freshwater marsh extending south from Lake Helen Blazes. The original unbroken marsh was similar in appearance to the Everglades (Sincock 1958). Drainage began in 1910 (Kettle 1912), and with the completion of the C-54 Canal in 1970, the last vestige of natural marsh in the area was drained. South of S.R. 60, completed in 1931 (A.L. Goodwin pers. comm.), the water table was lowered as much as 1.8 m. Approximately 608 km^2 (62%) of the original marsh have been drained, and most of the remaining is dry for most of the year with water hyacinth (*Eichhornia crassipes*) clogging the open-water areas. Three reservoirs, water depths 0.1 to 1.2 m, provide the only kite habitat in the St. Johns: the St. Johns Reservoir (712 ha), created in 1968 (Jack Purvis pers. comm.) (Indian River County); the Cloud Lake Reservoir (259 ha), completed in 1960 (John C. Norris pers. comm.) (northern St. Lucie County); and the Strazzulla Reservoir (65 ha) constructed in 1960 (Terry Mackey pers. comm.) (on the SW corner of Cloud Lake). These impoundments are used for water storage for citrus groves.

The Savannas is a long narrow freshwater marsh, water depths 0.1 to 1.5 m, between Ft. Pierce and Jensen Beach, lying west of and parallel to the Indian River. The marsh averages less than 1 km wide and is traversed by two roads and a railroad track. Only the northern 4 km of marsh north of Weatherbee Road in Savannas County Park is used by kites. About 7% of the historical marsh has been lost. Water levels are kept high by pumping.

Lake Okeechobee, lying in a shallow basin in southcentral Florida, is 60 km north to south and 50 km east to west. Most of the lake is open water but large marshes 0.8 to 14.5 km wide on the west side, extending from the Kissimmee River to Clewiston, are used by kites. Relatively little marsh exists on the north and east sides of the lake. Land elevations in the marshes range from 3 to 4.6 m msl and occasionally higher (Pesnell and Brown 1977). Water inflow is primarily from the north and west, and outflow is south into the Everglades (Parker et al. 1955). The lake level has fluctuated from 3.1 in 1956 and 1971 to 6.1 m msl in 1912. Before widespread drainage and construction of the levee system, it was generally assumed that the lake level commonly fluctuated around 6.1 m msl (Pesnell and Brown 1977). From 1967 through 1980, the lake level ranged from 3.1 to 5.4 m msl and was controlled by levees and locks. Most of the marsh vegetation within the levee system is a result of much lower lake levels since 1912. Prior to 1912 marshes were mainly outside the location of the present levee system (Harshberger 1914, Pesnell and Brown 1977). These marshes are used by kites extensively. The punk-tree (*Melaleuca quinquenervia*) has invaded north into the southern fringe of the marsh from the rim-canal. Water hyacinth occurs along the edge of the marshes and at a few scattered sites elsewhere. This plant is periodically controlled by herbi-

cide applications, but the effect is temporary. Alteration of water level regimes on Lake Okeechobee began when four large canals, the Hillsboro, Miami, New River, and West Palm Beach, were dug between 1906 and 1921 to drain the lake through the Everglades to the Atlantic Ocean. The St. Lucie Canal was dug in 1926 (Tebeau 1971). Between 1920 and 1926 a low muck levee was built on the south and east sides of the lake. The first levee around the lake was constructed between 1932 and 1938, and the present levee system was completed in 1978.

The Loxahatchee Slough is a long relatively narrow wetland, water depths 0 to 1.1 m, west of West Palm Beach and was formerly connected to the Everglades to the southwest. Drainage of the area began in 1913, and water movement was further altered by construction of a railroad across the middle of the slough in 1926 (Stockbridge and Perry 1926). After 1959, the C-18 Canal drained the northern part. Historically the slough was heavily used by kites, at least in some years (Howell 1932, Sykes 1984), but at present only the Lake Park Reservoir is occasionally used by the birds. All other remaining portions of the slough are dry much of each year.

The Everglades (Fig. 1) occupies a shallow basin extending 161 km from Lake Okeechobee to Florida Bay and is 48-80 km wide. Land elevations range from 5.8 m msl near Lake Okeechobee to 0.3 m msl in the south. The original

Fig. 1. Snail Kite habitat in southeastern Conservation Area 3A, Broward County, Florida. An aquatic slough white water lily (*Nymphaea odorata*) is in the foreground and sawgrass (*Cladium jamaicensis*) stands and a tree island are in the background. Kites hunt for apple snails over the sloughs.

marsh has been reduced about 45%. The remainder is managed in the Loxahatchee N.W.R. (CA1), Conservation Areas (CA2A, CA2B, CA3A, and CA3B), Holey Land, Rotenberger Tract, Everglades National Park, East Everglades, and Southeast Everglades. Natural water flow begins in the upper Kissimmee Valley near Orlando and moves south through a chain of lakes and the Kissimmee River into Lake Okeechobee and then into the Everglades. Historically, during periods of high water when the level of Lake Okeechobee reached 4.5 m msl, about 31 km of shoreline overflowed into the Everglades. The sheet flow of water slowly moved south and emptied into Florida Bay, the Gulf of Mexico, and into the Atlantic Ocean through short rivers, creeks, and underground flow. Before drainage the slope was 4.6 m in 161 km (0.3%) (Parker et al. 1955). Fires, in combination with water levels, sheet flow, and time and duration of flooding, have significantly affected the extent and composition of the various plant communities in the region (Robertson 1953, Loveless 1959, Hofstetter 1973, 1974). Sawgrass (*Cladium jamaicensis*) composes 60-70% of the total area of the Everglades, and wet prairies cover the next largest tracts. During the present study slough depths ranged from 0.0 to 1.6 m. Sloughs are the habitat most used by kites. The sloughs on the east and south sides of the conservation areas, because of the lower ground surface elevations, remain wetter longer than sloughs elsewhere in the Everglades, and some may retain a little water in severe drought years. As a result kites use these areas consistently. The punk-tree is steadily invading the Everglades along the entire east side and if not controlled will eventually convert the system from an open marsh to a swamp. This exotic tree appears to make rapid advances during droughts and when water levels are lowered exposing the marsh substrate.

Drainage of the Everglades began on a grand scale in 1906 and continued intermittently into the 1970's. Between 1906 and 1928, six major canals were dug: the North and South New River canals, started in 1906 and completed in 1912; the Miami Canal, 1909-1912; the Hillsboro Canal, 1910-1913; the West Palm Beach Canal, 1913-1921; and the Tamiami Canal, 1916-1928 (Anonymous 1956). The conservation areas were created between 1950 and the early 1960's by building an extensive levee system with water control structures and pumps (Tebeau 1971). Their main function was one of water storage and flood control, and at the time they were planned and built, little consideration was given to the needs of fish and wildlife. Since their construction, the wetter parts of the conservation areas have been used by the Snail Kite.

Results

Lake Okeechobee and CA3A were used most consistently by Snail Kites over the 14-year period and have supported the major part of the population since 1970 (Table 1, Fig. 2, 3). From 1967 until 1971, CA2A supported the greatest number of kites, but in the last decade was used sporadically by a few birds. Loxahatchee N.W.R. was used heavily in 1969 and the early 1970's but for the last five years kite numbers there have been low and its use sporadic. All other localities listed in Table 1 were used irregularly during the study.

TABLE 1. Maximum number of Snail Kites recorded in principal habitats in Florida, 1967-1980.[1]

Locality	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Annual Mean
Lake Kissimmee	—	—					1							1	0.1
St. Johns Reservoir	—	—	3		10	19	12	15	5	4	2	2			5.1
Cloud Lake Reservoir	—	—	—	—	—	6	13	1	2						1.6
Strazzulla Reservoir	—	—	—	—	—	4	7	5	2		1				1.4
The Savannas	—	—	—	—	—	—	—	1			4	3	3	1	0.9
Lake Okeechobee	5	6	3	5	31	21	42	41	39	51	48	46	114	214	47.6
Lake Park Reservoir	—	—	—	2					1	3	6				0.9
Loxahatchee N. W. R.			31	45	6	4	21	23	20	6	5	3	1		11.8
CA2A	39	50	91	38	43	7		2	7	5	2			1	20.4
CA2B				20	20							6	41	115	14.4
CA3A	6	2	1	65	44	53	63	48	62	84	100	212	273	305	94.1
CA3B				1									4		0.4
Everglades Natl. Park	8		9	13	14				1			3	3	15	4.7
East Everglades													10	1	0.9

[1]The numbers represent counts at irregular intervals or results of annual censuses (November-December 1969-1980), whichever were greater. Blank spaces in the columns indicate that no kites were recorded that year and a dash (—) means the area was not checked.

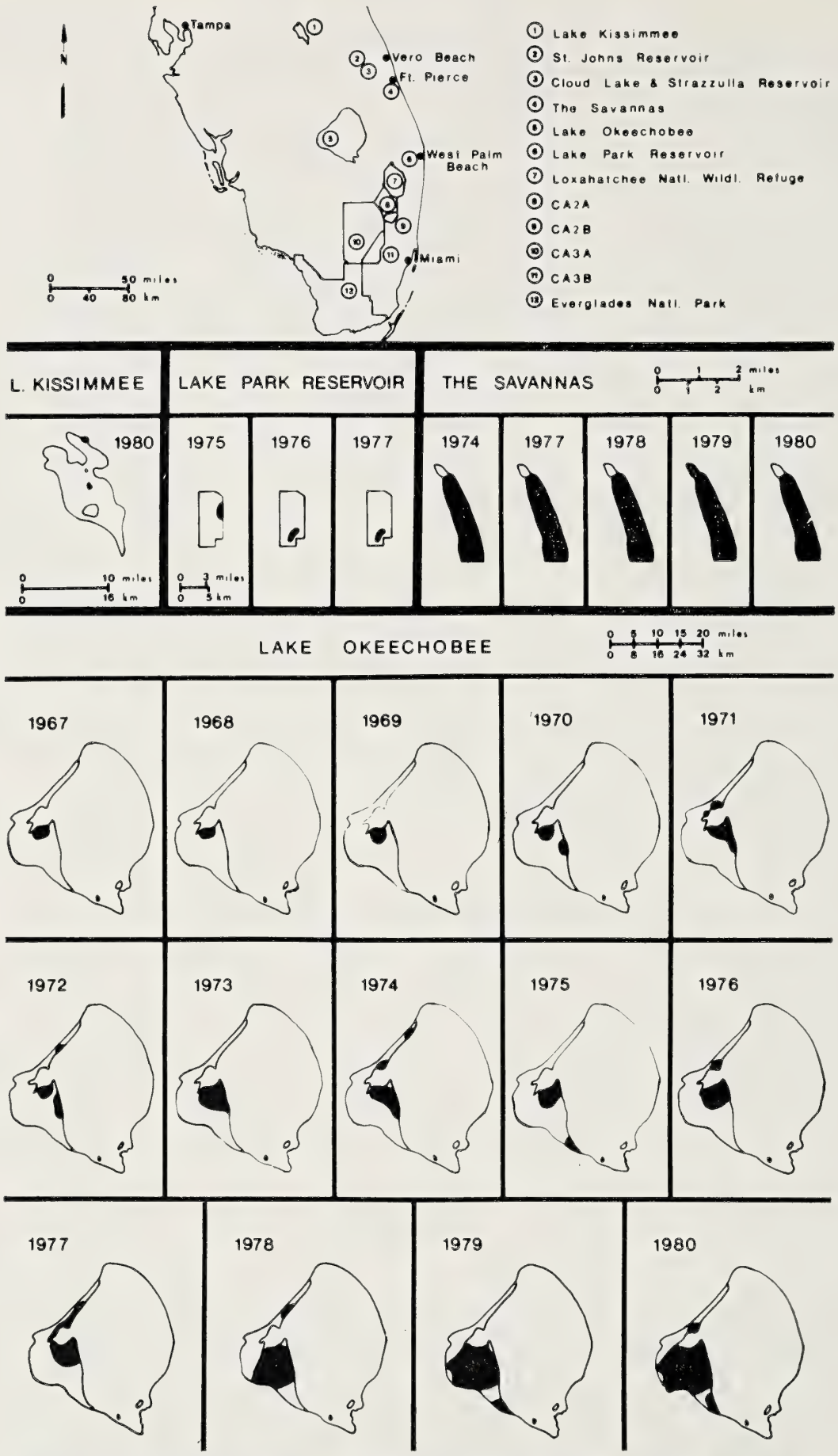

Fig. 2. Snail Kite occurrence at Lake Kissimmee, the Lake Park Reservoir, the Savannas, and Lake Okeechobee, 1967-1980. The location of all areas in this figure are shown in the map at the top. Areas having kite activity are shaded black. No map is shown for periods when no kites were recorded.

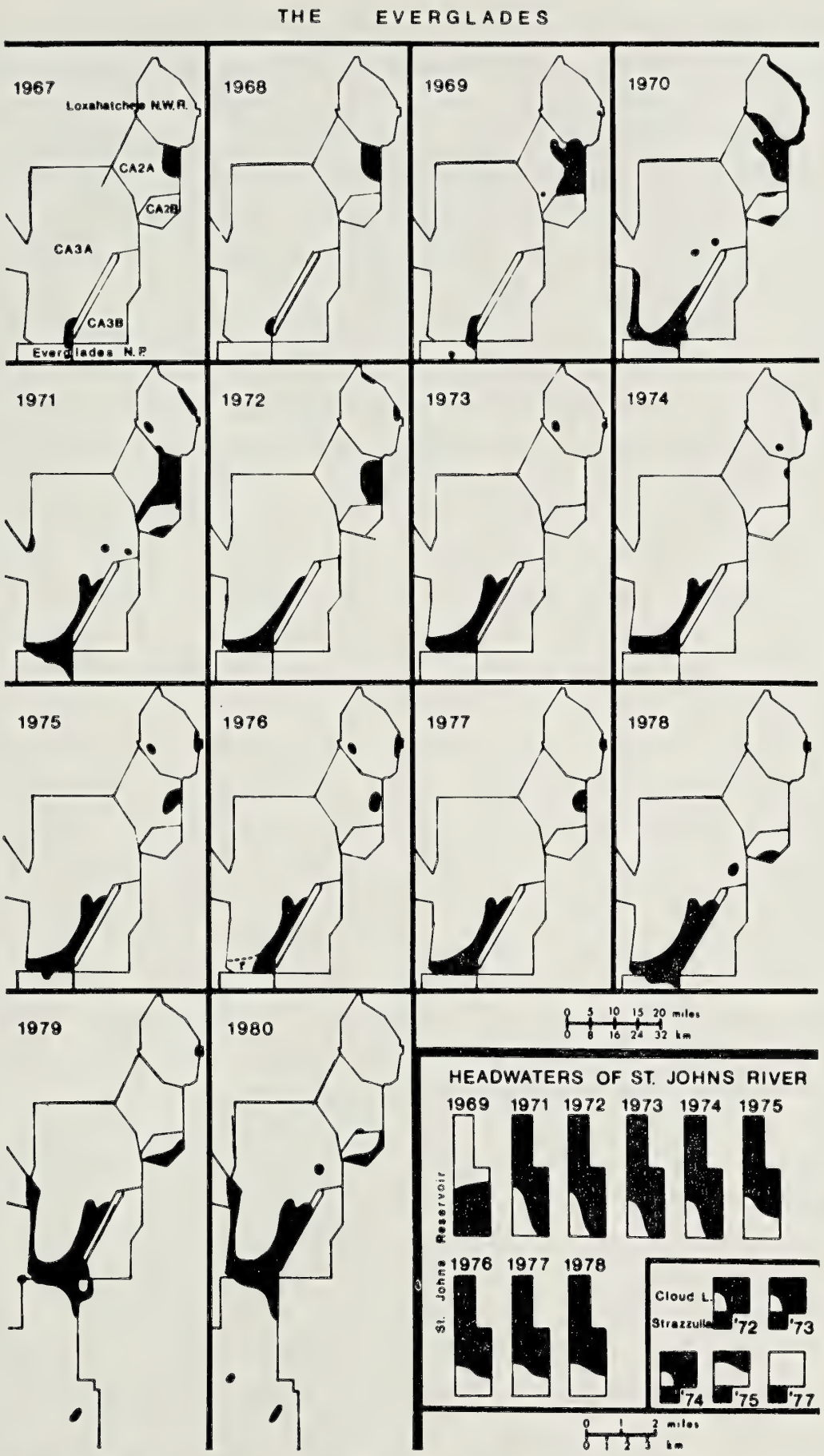

Fig. 3. Snail Kite occurrence in the Everglades Region (Loxahatchee N.W.R., CA2A, CA2B, CA3A, CA3B, and Everglades National Park) and on the Headwaters of the St. Johns River (St. Johns, Cloud Lake, and Strazzulla reservoirs), 1967-1980. Locations of these areas are shown at the top of Fig. 2. Areas having kite activity are shaded black. No map is shown for periods when no kites were recorded.

In drought year 1971, kites dispersed widely, and some individuals moved north through the peninsula into parts of the historic range that had not been occupied for many years (Sykes 1979, 1984). At the same time lone birds were observed in many localities in southern Florida where they are not usually found when wet conditions prevail in the principal habitats (Sykes 1984). Similar results were observed in the drought years of 1981-1982 by Beissinger and Takekawa (1983).

Kite presence at some localities was affected by changing habitat conditions, including water levels, relative abundance of the apple snail (*Pomacea paludosa*), and composition and size of plant communities, whereas in other places kite use changed without an obvious change in the habitat. Some areas, such as Lake Okeechobee and CA3A, usually are occupied by kites throughout the year; other areas received seasonal use (e.g. the reservoirs on the headwaters of the St. Johns which were used primarily during the spring, summer, and early fall). In most years individuals from more northern sites tended to move to the southern part of the state during the colder months.

I have only two records of kites using Lake Kissimmee through 1980. Lone birds were seen in 1973 (not in Fig. 2) (Kenneth Morrison *fide* Joseph D. Carroll, Jr. pers. comm.) and in 1980 (Fig. 2). Beissinger and Takekawa (1983) reported more intensive use of Lake Kissimmee in 1981-82. Kites used the headwaters of the St. Johns River (Fig. 2), steadily from 1971-1978 the St. Johns Reservoir, and from 1972-1975 Cloud Lake and Strazzulla reservoirs. Kite generally frequented all the marsh in the Savannas except north of the railroad track, although in 1979 a nest was found there (Helen and William Dowling pers. comm.).

The main areas that the birds used in the marshes on the west side of Lake Okeechobee (Fig. 2) were at Horse Island Cove, Government Cut to Monkey Box, Monkey Box to Observation Shoal and the southern part of Moonshine Bay, the north end of the Old Moore Haven Canal, Turner's Cove, Blue Hole, Observation Island and Moonshine Bay south to Uncle Joe's Fish Camp on the South Rim Canal, west to the Old Moore Haven Canal, and the marsh between the Old Moore Haven Canal west and northwest to Government Cut (and former site of Sportsman's Village). The increase in area occupied by kites on the lake from 1978 through 1980 resulted from lake levels being raised 0.6 m (from a maximum regulation schedule of 15.5 to 17.5 feet msl). In the Lake Park Reservoir (Fig. 2) kites were found at the two largest expanses of wet prairie.

At the Loxahatchee N.W.R. kites were primarily along the east and south sides. The flooding of small impoundments of Compartment C just south of headquarters on the east side of the refuge periodically attracted small numbers of kites. In CA2A the east half had the greatest use, whereas in CA2B the southern portion had the most use, although some birds were found along the east side in 1979 and 1980. The occurrence of kites in CA3A from 1967 to 1980 was mainly in the eastern sector along L-67A Levee from the Tamiami Trail (U.S. Hwy. 41) north to within 5 km of the Miami Canal, and along the southern sector from L-67A Levee west to L-28 Levee and from the Tamiami Trail north for several kilometers. Substantial kite use along L-28 Levee from the Tamiami trail north to the Tieback Levee (about 31 km north of the Trail) and beyond was recorded in 1970, 1979, and 1980. In 1978 and 1980, kites used CA3A several kilometers southwest of what was formerly Andytown (now the highway interchange of I-75, U.S. Hwy. 27, and S.R. 84). No kites were in CA3A north of Alligator Alley (S.R. 84) during the 14-year period. Occurrence in the Pocket (marsh between CA3A and CA3B enclosed by levees L-67A and L-67C) was regular on a short-term basis by 1-10 individuals from eastern CA3A. Kites occurred in southwest CA3B sporadically in small numbers. From 1967-1980, kite use in the Everglades National Park was primarily in the Shark Valley Slough just south of the Tamiami Trail, with some present in 1979 and 1980 in Taylor Slough in the southeastern part of the park (see Kushlan and Bass 1983).

Substantial losses of freshwater marshes in Florida that have occurred since the early 1900's have altered habitat and reduced the distribution and population level of the Snail Kite. Before drainage, the principal large tracts of marsh in the southern part of the peninsula were estimated to have occupied between 13,000 and 14,000 km^2 [existing marsh is about 7000 km^2] (Table 2). Now, the 10 freshwater marsh systems (Table 2) that constituted most of the pre-drainage habitat of the kite have been reduced in size, and the Palm Beach coastal marshes have been completely eliminated. These coastal marshes were formerly along the west side of the old beach ridges and extended from the present location of North Palm Beach south through lakes Mangonia, Clear, Osborne, and Ida to northern Boca Raton.

Existing marshes in southern Florida comprise only 6949 km^2 or 51% of the original wetland available for kite use (Table 2). This massive reduction of habitat and subsequent alterations were

TABLE 2. Approximate size of freshwater marshes, changes in the amount of potential habitat, and use of such areas by the Snail Kite.[1]

Wetland System	County	Size of marsh habitat (km^2)				
		Pre-drainage	Remaining	% Change	Kite use 1967-1980	% remaining used by kites
Headwaters St. Johns River	Brevard, Indian River, St. Lucie	977	369	- 62	11	3
The Savannas	Martin, St. Lucie	14	13	- 7	2	16
Kissimmee River	Glades, Highlands, Polk, Okeechobee, Osceola	256	44[2]	- 83	0	0
Indian Prairie-Isotokpoga Marsh	Glades, Highlands	711	41	- 94	0	0
Marshes W Lake Okeechobee	Glades	133	63	- 53	0	0
Caloosahatchee River Basin	Glades, Hendry	327	17	- 95	2	10
Lake Okeechobee Marshes	Glades, Hendry, Martin, Okeechobee, Palm Beach	0[3]	380	+100	304	80
Palm Beach Coastal Marshes	Palm Beach	146	0	-100	0	0
Loxahatchee Slough	Palm Beach	143	52	- 64	7	14
The Everglades	10 S. Florida counties	10,862	5,970	- 45	896	15
Total		13,569	6,949	- 49	1,222	18

[1]Small marshes in the northern half of the peninsula and in the Big Cypress Region of Collier County have not been included because of incomplete data.

[2]Data from R. L. Goodrick and J. F. Milleson (pers. comm.).

[3]According to Pesnell and Brown (1977) most of the marsh at Lake Okeechobee was located outside of the existing levee system as a consequence of predrainage hydrological conditions. The original marsh outside the present levee system is included in the marshes west of Lake Okeechobee.

probably responsible for the reduced distribution and population of the Snail Kite, leading directly to endangerment. From 1967-1980, 1222 km² were used by kites. This represents only 18% of the marsh habitat presently available, and only a part of this percentage was used at any one time.

Discussion

The apple snail is abundant and available as food for the Snail Kite only when marshes have been flooded for a period of several years. When the marsh dries because of natural drought or drainage, snails are unavailable to the kite (Sykes 1979). The importance of the apple snail to the Snail Kite has been widely discussed (Howell 1932, Bent 1937, Sprunt 1945, 1947, Stieglitz and Thompson 1967, Snyder and Snyder 1969, Sykes and Kale 1974, Sykes 1978, 1979).

Although natural droughts occur about once every 5 to 10 years (Parker et al. 1955, Thomas 1974), droughts probably did not exert as prolonged and severe effects upon the kite prior to drainage and heavy use of fresh water by man. In severe droughts, such as in 1971, 1981, and 1982, the marshes of Lake Okeechobee and the northern Everglades go dry, except for the large canals, a few of the deeper sloughs, and alligator holes. During such conditions, habitat for the Snail Kite is drastically reduced and temporarily eliminated over large areas. The birds are forced to disperse, and many individuals do not survive (Sykes 1979, 1983, Beissinger and Takekawa 1983).

Artificial drainage of South Florida marshes for the past 70 years has been detrimental to the kite. Water from Lake Okeechobee and the Everglades was drained continuously by large canals to the southeast coast from 1912 until 1946, when control structures were placed at the seaward ends of these canals (Klein et al. 1974). During this 34-year period, kite habitat continued to disappear, and the water table in southeast Florida was permanently lowered in some places by as much as 1.5 m (Parker 1951, Parker et al. 1955).

In the Everglades, water management has replaced the historic sheet-flow of fresh water that uniformly flooded the marsh with pools of water in the conservation areas. The once unbroken marsh is now divided into compartments by levees and highway corridors that function as additional levees. Large areas of existing marsh are dry for part of each year and are not used by kites. In contrast some parts of the conservation areas are flooded too deeply

for too long and other sections are not flooded sufficiently or for too short a period. A seasonal cycle of slow fluctuating water levels is necessary to maintain the natural plant communities and associated fauna of the Everglades (Robertson 1953, Loveless 1959, Hofstetter 1973, 1974, Klein et al. 1974, Gleason 1974).

The abundance of apple snails undoubtedly is the key to kite use of a given area. However, no reliable technique to census these mollusks in marshes has been perfected. The presence of kites is an indication of a good snail population in an area, and in the warmer months the presence of snail egg masses can provide a crude index. Knowledge of the snail's ecology is also inadequate for sound management, and a study to obtain such data is a high priority. Factors other than abundance of apple snails may determine whether kites occupy an area. For instance, the number of kites using CA2A decreased significantly from 1969 to 1970 although apple snails were still relatively abundant.

Water levels on the reservoirs of the headwaters of the St. Johns River were erratic during the study, and the water carried heavy loads of agricultural chemicals. This may have accounted for low apple snail populations in some years and reduced kite use. The effects on apple snail populations of these chemical compounds may be detrimental and need to be studied.

From 1967 through 1980, parts of the marshes at Lake Okeechobee and in the eastern and southern parts of CA3A had substantial apple snail populations and were used steadily by kites. Lake Okeechobee had higher water levels from 1978 through 1980 (because water schedules were revised; range of maximum levels: 4.5-5.1 m msl in January and December 1978; 4.5-5.4 m msl in July and October 1979; and 4.2-5.3 m msl in December and January 1980) than from 1967-1977. In 1979 and 1980 water levels were also high in CA3A. The favorable conditions associated with higher water levels (i.e. abundant and available snail populations) on both the lake and in CA3A combined with the rapid kite population increase during these years (Sykes 1979, 1983) probably accounted for the increased kite occupation at these localities during the last several years of study.

During 1967-1980 the snail population on the Loxahatchee N.W.R. was relatively low compared to Lake Okeechobee and CA3A, but the cause is not known. The snail population in CA2A was very high in the late 1960's through 1970 but was drastically reduced by the 1971 drought and again in 1973 when the South Florida Water Management District dried the area in an attempt

to restore some of the plant communities that had disappeared. Since 1970, the snail population in this area has not regained its former abundance (Sykes 1979, in prep.).

Intensive management for a single species is neither practical nor desirable at Lake Okeechobee, in the conservation areas, and in the Everglades National Park. In most years parts of these areas afford some habitat for kites, but conditions change drastically during droughts (Sykes 1979, 1983, Beissinger and Takekawa 1983). Therefore, I recommend that selected "islands" of habitat or potential habitat (areas that can be developed where necessary), scattered within the historic range, be managed for kites to enable a large number to survive through critical dry periods when the larger habitats are temporarily unsuitable. Such management units would lessen population crashes during droughts. The management units should be paired or clustered so that while one is available for use by the birds another in the same general locality can be rejuvenated (i.e., drained, burned, scarified, or otherwise modified). Kites show a definite preference for expansive open marshes with an abundant apple snail population. Therefore management units should be as large as practical, and none less than 40 ha. Because kites are nomadic they can readily locate managed units.

The marshes most heavily utilized by kites consisted of 50 to 75% wet prairies and aquatic sloughs, 25 to 40% sawgrass, and 5 to 15% willows, tree islands, and other components. Managers should strive for a mix of the most important plant communities with irregular configurations and maximum edge effect within the percentage ranges given. An example might be a management unit with a combination of wet prairie and aquatic slough around its perimeter with a stand of sawgrass in its central portion that also contains a small clump or two of willows (*Salix caroliniana*) or small willow strand with a few individual small willows, pond apples (*Annona glabra*), dahoon hollies (*Ilex cassine*), and buttonbushes (*Cephalanthus occidentalis*) scattered over the entire area to provide convenient perches. Water levels in the management units should be fluctuated to simulate the natural hydroperiod; water depths should be lowest from late April to early May, slowly rise to a high in November, and then slowly return to the early May low. Water depths should range from 0.2 to 1.0 m. It is important that all water level changes be gradual to avoid disruptive conditions.

When "island" habitat units are first established or following a periodic drying, it might be necessary to introduce apple snails

into the area to obtain the desired high mollusk population density. Such a seeding operation was determined to be feasible where the snail population is low or has been eliminated because of previous conditions (Martin and Doebel 1973). The managed areas should be drained, dried out, and burned about every 6 to 10 years—the inland freshwater marshes of Florida evolved under conditions of periodic drought during which uncontrolled fires occurred (Cohen 1974).

I conclude that some areas will have to be managed specifically for the Snail Kite if we wish to retain a population in Florida because the existing habitats under present conditions are highly unstable and under pressure for additional uses, and further modifications will occur. Only through maintenance of the remaining large marsh systems in as close as possible to their natural condition and the creation of smaller "island" habitat units for drought use will the availability of suitable habitat for the Snail Kite in Florida be assured.

Summary

Of the principal habitats used by the Snail Kite in Florida from 1967-1980, Lake Okeechobee and CA3A had the most consistent use, had the greatest amount of area used, and supported the major portion of the population. The spatial use from year to year for each locality is compared. About 49% (6620 km^2) of the original potential kite habitat in southern Florida has been lost and of that portion remaining, only 18% (1222 km^2) was used by kites from 1967 through 1980. The lack of water to flood the marsh habitat in drought years is the most critical factor confronting the species.

The loss of suitable freshwater marsh habitat has been the single most important factor responsible for the decline of the Snail Kite in Florida. With the human population increasing in the state and the resulting demands for more land development and fresh water, further loss of existing wetlands is inevitable. In drought years the demands for surface waters exceed the supply, and there is insufficient water to maintain flooded conditions in most existing kite habitats. I recommend that the large natural habitats be preserved maintaining as close as possible to a natural hydrologic regime and that selected key smaller areas not less than 40 ha, scattered within the historic range of the kite in Florida but outside the Lake Okeechobee marshes, the conservation areas, and the Everglades National Park, be managed specifically for this species to reduce population crashes during droughts, Such areas would also benefit other wildlife.

Acknowledgments

I extend my appreciation to the many persons who assisted me in the field and in numerous other ways during the course of this study, particularly: Oron L. Bass, Jr.; William J. Bolte; Daniel M. Cary; Roderick Chandler; L. Carlton Chapell; Earl E. Diemer; J. Walter Dineen; John H. Doebel; Helen Dowling; William Dowling; John R. Eadie; Lynda J. Garrett; Warren Hagenbuck; Greg Harrison; A. Ronald Hight; Hugh V. Hines; Marvin T. Hurdle; Joseph D. Johnston; Herbert W. Kale, II; Ralph M. Keel, Jr.; Howard P. Langridge; James N. Layne; John Lindell; Thomas W. Martin, Jr.; Edward C. Murczek; John C. Ogden; Gary L. Pesnell; James Pilgreen; Cynthia H. Plockelman; Ray H. Plockelman, Jr.; John G. Powell; Jack Purvis; Roy Raymond; William B. Robertson, Jr.; James A. Rodgers, Jr.; Even L. Rude; Robert W. Slattery; Ronald C. Snider; Helen A. Snyder; Noel F. R. Snyder; Roger A. Spaulding; Charles W. Strickland; Joan J. Sykes; Wesley J. Sykes; Jean E. Takekawa; Donald E. Temple; Richard L. Thompson; Ira E. Westbrook; James M. Williams; Erwin Winte; John S. Wise; Kevin A. Wood; and Ruth E. Young. I further thank Steven R.Beissinger, Herbert W. Kale II, William B. Robertson, Jr., and J. Michael Scott for suggestions for improvement of the manuscript.

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HABITAT USE BY AND DISPERSAL OF SNAIL KITES IN FLORIDA DURING DROUGHT CONDITIONS

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Although originally ranging over most of peninsular Florida (Howell 1932), Snail (Everglade) Kites (*Rostrhamus sociabilis plumbeus*) have been restricted in recent years mostly to three areas in southern Florida: the western marshes of Lake Okeechobee; Conservation Area (CA) 3A; and CA2 (Sykes 1978, 1979, 1983). Severe drought in southern Florida in 1981 dried nearly all wetlands inhabited by kites. Water levels at Lake Okeechobee were at record lows (2.9 m msl) in July and August, drying 99% of the wetland area. Water remained about 1.5 m below scheduled levels until June 1982 when it quickly rose as a result of heavy summer rains. Only perimeter canals contained surface water from May-August 1981 in CA3A and March-August 1981 in CA2 when Tropical Storm Dennis (16-19 August) replenished surface water supplies. After reaching scheduled levels in September 1981, water decreased again until CA2 dried out in February and CA3A in early May 1982. In late May 1982, surface water rose quickly again to near normal levels.

As a result of habitat unavailability caused by this drought, Snail Kites dispersed throughout the Florida peninsula in search of foraging habitats with apple snails (*Pomacea paludosa*), practically their sole source of food (for exceptions see Sykes and Kale 1974, Woodin and Woodin 1981, Takekawa and Beissinger 1983, Beissinger in prep.). This paper documents the areas used by kites during the drought and throughout the following year when snail populations remained depressed and water levels remained low throughout southern Florida. We also discuss the use of a sighting clearinghouse as a tool for monitoring kite movements, and the importance of some marginal habitats for kites during low water periods.

Methods

From January 1981-July 1981 and December 1981-August 1982, Beissinger (SRB) visited regularly all major areas used by kites, mostly Lake Okeechobee and CA3A in 1981, and CA3A, Lake Kissimmee, and Lake Tohopekaliga in

Florida Field Naturalist 11: 89-106, 1983.

1982. He visited potential kite habitat in central Florida, especially after kites had dispersed from southern Florida. Most searches were conducted from an airboat using transect and roost counts (Sykes 1979). Snail egg abundance and water levels were noted periodically.

The "Everglade Kite Sighting Hotline" was established at Loxahatchee National Wildlife Refuge in June 1981. Hotline sightings were solicited statewide by a series of newspaper articles, radio announcements, and the dissemination of an Everglade Kite news alert, which appeared in popular publications. Hotline reports were received by telephone, letter, or in person. Hotline sightings were verified by Takekawa (JET) by telephone and occasionally by a visit to the site. In verifying a sighting, a detailed description of the appearance of the bird was obtained as well as its behavior, vocalizations, and habitat. Observer experience and knowledge were evaluated and at times played an important role in the verification process.

In verifying hotline sightings, confusion sometimes occurred with Northern Harriers (*Circus cyaneus*) during winter months and American Swallow-tailed Kites (*Elanoides forficatus*) and Mississippi Kites (*Ictinia mississippiensis*) during summer months. Because Northern Harriers superficially resemble Snail Kites, behavioral cues were used to evaluate the reliability of questionable sightings. Fortunately, most hotline sightings were received in summer when harriers are seldom present. American Swallow-tailed Kites often were reported as Snail Kites because locally they sometimes are called "Everglade Kites" but were easily detected in interviews because of their strikingly different physical appearance. Mississippi Kites were distinguished by appearance, habitat, and geographic location. Based on the broad range of characteristics we evaluated for each sighting, and the unique behavior and appearance of Snail Kites, verifying hotline sightings was relatively easy.

Sighting locations were grouped into three categories based on kite use from 1970-1980 (Sykes 1979, 1983, pers. observ.). Primary areas were used extensively. Secondary areas received irregular or sporadic use. Drought-related areas received little or no kite use except during dry periods. Habitats in drought-related areas were further characterized: (1) canals, stratified by type of use and size (agricultural, urban, roadside, main); (2) marshes, classified by the duration of flooding as either seasonal or permanent; (3) artificially created marshes, including farm ponds, borrow pits or shellpits; (4) natural open water habitats were separated by size into lakes or ponds and all running water habitats were large enough to be designated as rivers; (5) dwarf cypress swamp consisted of sawgrass (*Cladium jamaicensis*) stands and aquatic sloughs with scattered cypress trees or tree islands (*Taxodium ascendens, T. distichum*); and (6) agricultural fields.

Results

Locations of Snail Kite sightings from December 1980-August 1982 are summarized in Fig. 1 and Table 1. Below, sightings are discussed by general habitat categories. Observer initials follow each sighting in parentheses and are indexed in the Acknowledgments section.

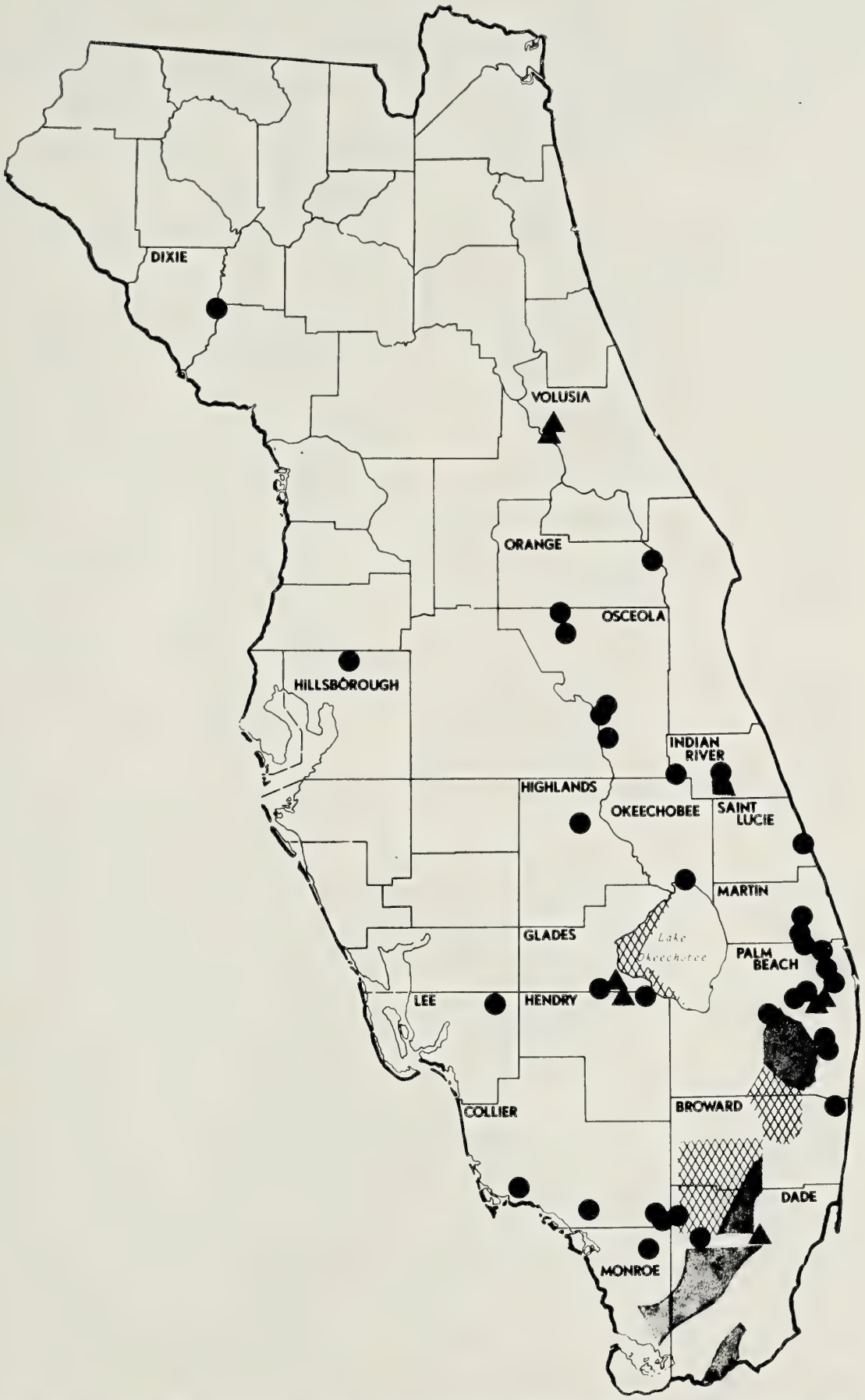

Fig. 1. Areas of primary and secondary use by Snail Kites and locations of drought-related sightings from April 1981-August 1982. Primary areas are crosshatched. Secondary areas are shaded. Single locations of drought-related sightings are shown by dots, and triangles represent two nearby locations.

TABLE 1. Drought-related sightings of Snail Kites in Florida from April 1981-August 1982 outside of primary and secondary areas. Habitat types are defined in the Methods section. The location and observers responsible for documenting each sighting appear in the appendix by the numbers listed below.

No.	County	Habitat	Dates	Number of Kites
1	Broward	Shell rock pit	May-Sept. 1981	2
2	Collier	Permanent marsh	30 April 1981	14
3	Collier	Borrow pit	6 May 1981	1
4	Collier	Turner River	16 Dec. 1981	1
5	Dade	Main canal	30 April 1981	1
6	Dade	Main canal	15 May 1981	1
7	Dade	Dwarf cypress	8 July 1981	2
8	Dade	Main canal	7 Sept. 1981	1
9	Dade	Dwarf cypress	1-5 Oct. 1981	1
10	Dixie	Suwanee River	5 June 1981	1
11	Glades	Lake Hicpochee	5 Feb. 1981-29 Jan. 1982	2-17
12	Glades	Farm pond	8 May 1982	1
13	Glades	Caloosahatchee R.	18 Jan. 1982	1
14	Hendry	Agricultural canal	15 July 1981	1
15	Hendry	Agricultural canal	17 Aug. 1981	1
16	Hendry	Agricultural canal	29 Aug. 1981	1
17	Highlands	Lake Istokpoga	5 June, 27-28 Sept. 1981	0, 1
18	Hillsborough	Borrow pit, Seasonal marsh	6 June 1981	1
19	Indian River	Permanent marsh	24 April 1981, 14 May 1982	1, 3
20	Indian River	Roadside canal	26 April 1982	1
21	Lee	Caloosahatchee R.	3 Sept. 1981	1
22	Martin	Seasonal marsh	5-28 May, 29-31 Aug. 1981	1
23	Martin	Seasonal marsh	23 May 1982	2
24	Monroe	Dwarf cypress	12, 25 June 1982	7-8
25	Okeechobee	Borrow pit	2 Aug. 1981	1
26	Orange	St. Johns River	28 Oct. 1981	1
27	Osceola	Roadside canal	23 July 1981	1
28	Osceola	Lake Kissimmee	June 1981-Aug. 1982	3-25
29	Osceola	Lake Tohopekaliga	Oct. 1981-Aug. 1982	6-32
30	Palm Beach	Seasonal marsh	13-14 July 1981	1
31	Palm Beach	Seasonal marsh	19 Oct. 1981	1
32	Palm Beach	Agricultural canal	20 April 1982	1
33	Palm Beach	Seasonal marsh	21 April, 26 May 1982	1

No.	County	Habitat	Dates	Number of Kites
34	Palm Beach	Urban canal	6 May 1982	1
35	Palm Beach	Urban canal, Seasonal marsh	May 1981	1
36	Palm Beach	Main canal	May 1982	1-3
37	Palm Beach	Agricultural field	late May-11 June 1982	1-2
38	Palm Beach	Agricultural canal	29 June 1982	1
39	Palm Beach	Main canal	20 June 1981	1
40	Palm Beach	Urban canal	19-21 June, 15 Aug. 1981	3, 1
41	Palm Beach	Urban canal	June-Sept. 1981, Jan. 1982	1-8
42	Palm Beach	Roadside canal, Permanent marsh	9 Sept. 1981, April-May 1982	1-2
43	St. Lucie	Permanent marsh	2 May 1982	1
44	Volusia	Permanent marsh	5-7 June 1981, 2 Dec. 1982	1
45	Volusia	Scoggin Creek	19 June 1981	2
46	Volusia	Spring Garden Creek	15 July 1982	1

Primary Areas

Lake Okeechobee (Glades, Hendry, and Palm Beach Counties).—Kites began to move away from Lake Okeechobee in winter 1981. In late January-March 1981, 100-120 kites were spread throughout the southwestern and northwestern shores (SRB) in contrast with 214 in December 1980 (Sykes 1983). As water levels dropped and lake margins dried out, kites concentrated in more interior areas near the mouth of Moonshine Bay, Fisheating Creek, and along the northwest shore to Horse Island. In mid-May 1981, SRB estimated the lake population to be 75 kites and counted only 58 birds from 9-15 June 1981. When water depths reached record lows in July and August 1981, nearly all kites had moved to sections of the rim canal near Moore Haven and Clewiston, the mouth of Harney Pond Canal, and along the northwest shore near Little Sarasota boat landing (SRB). Three kites were near Lake Harbor and Ritta Island where birds had not been seen in previous years (SRB). Radio tracking indicated frequent movements of kites on and away from the lake during June and July 1981 (Beissinger unpubl.). On 2 October 1981, two kites were on the rim canal near Moore Haven (MZ).

By late November 1981, James A. Rodgers found only two kites and Beissinger found only one kite near Ritta Island from 18-20 December 1981 during thorough censuses. Six kites were near Horse Island on 28 and 29 January 1982 (SRB) on a thorough search of the lake and they remained there until 2 February 1982 (NAC). Noel Chandler found no kites during five searches in February nor any on 2 April 1982. His kite sightings began again in April 1982 at Horse Island where 3 to 4 kites were regularly seen through mid-May and 19 were observed on 7 April. No birds were found during four searches in June (NAC) nor any on 8 and 23 July 1982 (SRB). Snail eggs were few and found only along open water edges of marshes near the main lake or canals.

In summary, Lake Okeechobee supported a sizeable kite population from winter through spring 1981 and was the only major area where large numbers of kites occurred during drought conditions throughout the summer of 1981. The lake probably served as an important survival habitat, but water levels remained low on the lake until summer 1982. As a result of prolonged low lake levels, kite use declined from fall 1981 to summer 1982.

Conservation Area 3A (Dade and Broward Counties).—In a thorough census, Sykes (1983) counted 305 kites in December 1980, making CA3A the area of highest kite concentration before the drought. Kite movement in CA3A was extensive in winter 1981 as water levels declined, illustrated by a drop in the number roosting behind the Miccosukee Restaurant on US 41 from slightly over 100 in December 1980 (PWS, DMC) to 25 on 24 January 1981 (SRB, DMC). However kite use remained high in CA3A as 108 birds were noted at an evening roost by SRB on 14 February 1981 in the southeast corner. On 22 April 1981, 30-40 kites were seen behind the Miccosukee Restaurant, many of these were attempting to nest (SRB). But, in response to drying conditions, kites had moved into surrounding canals where 12-16 birds were observed along a 17 km portion of the L-67A heading north from US 41 on 20 May while only four kites were seen at the Miccosukee roost (SRB). Helicopter searches on 1 and 4 June 1981 detected no kites and no standing water (SRB, DMC). Three sightings of one to three kites from June through August 1981 were limited to perimeter canals since the area was dry (DMC, MH, BC). After water levels rose in mid-August 1981, the frequency of kite sightings increased: 8 sightings from September-November totaling 41 kites (the largest was of 13 kites) were mostly from interior locations (PAC, WD, DRS, JLS, JDW, MZ).

In a census count in December 1981 James Rodgers found 78 kites. Counts in January 1982 totaled 154 birds and increased to 176 kites in March 1982 (SRB). The largest roosting concentration was behind the Miccosukee Restaurant on US 41 where Beissinger conducted five roost counts from January-March 1982 that yielded a mean of 95 kites (SD = 8). By 17 April 1982, when water levels were very low, this roost had shrunk to 11 kites. Subsequent counts in June and July each produced only three kites (SRB). Twice during this period, kites were seen again near perimeter canals (SH, PWS, BH). Generally, kite density was very low during summer 1982. Thorough airboat searches by Beissinger detected only five kites on 19 June 1982 and none from 26-28 July 1982. Scattered sightings included four birds just south of the Alligator Alley Rest Area on 18 July 1982 (JW), one on 25 July 1982 on the north side of US 41 opposite the Shark Valley entrance to Everglades National Park (JS), four to six kites at the north end of the L-28 gap on 3 August 1982 (MZ), and two kites 8 km south of Bridge 11 and SR 84 on 26 August (MA) and one there on 30 August (LR). Throughout the spring and summer months, snail eggs were uncommon and snail capture times for kites seemed long (SRB).

Thus, CA3A supported the major concentration of kites during both winters of our survey. In 1981, populations probably remained high until late April when drought conditions caused massive dispersal. Kites began regrouping in CA3A by September 1981 when water levels rose. In winter 1982, this area supported approximately 79% of the known birds in Florida (Bessinger unpubl.). Dispersal occurred again in April 1982 as a short term dry-down probably decreased already low snail populations. Despite reflooding and good water levels in June and July 1982, kites did not return to CA3A as snail populations were very low.

Conservation Area 2 (Broward and Palm Beach Counties).—In CA2A, one kite was seen in December 1980 (Sykes 1983). From February-August 1981, water levels in CA2A were very low as part of a scheduled dry-down. No kites were seen during helicopter searches on 1 and 4 June 1981 (SRB, DMC) and only one kite was seen, near water gauge 2-17, on 15 September 1981 (DRS). In early December 1981, one kite was noted on a thorough census (JAR) but by mid-January 1982 the area was drying again, and none were found on a 24 January 1982 airplane search (SRB). A few sightings occurred after reflooding in spring 1982, six or seven

kites on 28 March (ED), and eight in mid-May (PWS) in the south end near Sawgrass Recreation Area and two sightings in mid-May in the north end of one or two birds (RT, CW). A 20 June 1982 airplane search and a 21 June 1982 check of the southeast end located no kites, and snail eggs were scarce (SRB). In CA2B (Broward County), Sykes (1983) noted 115 kites in mid-December 1980. By 24 March 1981 Beissinger saw only 12 kites during a thorough search as water levels were low. None were seen during 1 and 4 June 1981 helicopter searches (SRB, DMC) when the area was completely dry. After reflooding, one kite was found in early December 1981 during a thorough search (JAR) and one on a 24 January 1982 flight (SRB). This area remained dry until late April 1982. Two kites were noted on a thorough search on 20 June 1982 although snail eggs were very scarce (SRB).

In summary, kites used CA2B in large numbers before water levels dropped rapidly in late winter 1981. Extended dry conditions from April-August 1981 and February-April 1982 probably greatly reduced snail populations, resulting in little use of CA2A or CA2B by kites from spring 1981 through summer 1982.

Secondary Areas

Loxahatchee National Wildlife Refuge (Palm Beach County).—Water levels averaged approximately 0.4 m below scheduled levels throughout 1981. Although one-quarter to one-third of the refuge remained wet during the drought, much of the northern two-thirds held little standing water from April through mid-August 1981. Aerial wading bird surveys on 17 April, 8 May, 29 June and 24 July (PF, BP) produced no kite sightings. The only summer sighting occurred on 5 June 1981 when a group of seven kites was seen soaring over the refuge interior west of headquarters (EM, TL). Although water levels quickly rose over 0.4 m from mid to late August, they fell again in October, remaining below schedule through February 1982. A single kite was seen on 18 November 1981 at the southern tip of the refuge (TS). On 23 and 31 December 1981 (AG, GH), one kite was in the impoundments south of refuge headquarters. A 7 January 1982 aerial survey for deer produced a sighting of one kite in the interior of the refuge (JDW). No kites were located on monthly ground waterfowl surveys from October 1981-February 1982 (JET). Water rose in March and remained high through July 1982. Six sightings totaling 14 birds occurred sporadically from April through July at the headquarters impoundments

(DM, BH, PH, RVH, PWS, SP1). The canoe trail west of refuge headquarters received use by at least four foraging kites on 12 and 13 April 1982 (RVH, JET, JK, SM). On 28 July 1982 T.H. Koundakijan sighted a single kite 1 km south of refuge impoundments on the east side of L-40.

Conservation Area 3B (Dade County).—From January-August 1981, this area was dry. One kite was noted on 2 and 7 September 1981 (DMC) and 24 were seen on 15 October 1981 in the southwest corner (JDW). A thorough search in December 1981 yielded 13 kites as water levels were quickly falling (JAR). Airplane checks on 16 and 24 January 1982 detected four kites in the southwest corner (SRB). On 15 March 1982, 10 kites were observed (SRB) in the northeast corner 1 km west of M. P. Thompson Park on US 27. From April-May 1982, this area was dry. In late June, Pat Reynolds found 33 kites roosting about 1 km north of Everglades Safari on US 41.

Everglades National Park (Dade County).—A December 1980 survey found 14 kites (Sykes 1983). Water levels decreased through winter 1981, and by 20 February 1981 in a helicopter search, only three kites were located in Shark Valley Slough and none in Taylor Slough (OLB, SRB). Following below-average rainfall through the spring and summer, water levels were low in July 1981. A single sighting of one kite was reported on 3 August on the main park road 2.5 km south of Pa-hay-o-kee (LM). Tropical Storm Dennis raised water levels rapidly in August. On 18 August 1981, Doug Cuillard noted three kites south of the main park road over Royal Palm at the edge of Taylor Slough. A single kite was noted on 29 August 1981 on the main park road 100 m south of the entrance station approaching Taylor Slough (WB). Patricia Carrington saw three kites south of US 41 and west of the Shark Valley entrance road on 7 November 1981. By December, water levels were lower than during the same month of the previous year and only one kite was found in Shark Valley and none in Taylor Slough (JAR). Below average rainfall recorded during summer 1982 was offset by record discharges of water into the Park from the flooded conservation areas. Four kites were seen on 29 April along the Shark River Slough airboat trail between staff gauges 14 and 15 (BL). On 9 May, K. Overman saw four kites near Parotis Pond.

Headwaters St. Johns River (Indian River County).—A pair of kites was noted building a nest early in April 1981 (HWK) in the northeast end of the reservoir, and on 28 May 1981 the male was seen feeding a fledgling (SRB). One kite was observed in the north-

east corner on 22 March 1982 (SRB) and three on 14 May 1982 (SRB, NAC, RC), but no signs of breeding were noted, and snail numbers appeared low.

Drought Related Areas

Drought-related sightings of Snail Kites are summarized in Fig. 1 and Table 1. Kites were observed at 46 separate locations outside of primary and secondary areas. At some locations, kites were seen repeatedly (e.g., No. 22, 24, 35, 37, 40 in Table 1), sometimes during both years of our survey (e.g., No. 11, 19, 28, 29, 41, 42, 44), while at other locations kites were reported only once (e.g., No. 2-8, 12-16). Two sightings (No. 10, 18) were the first records of Snail Kites in those counties (Sykes in prep.).

Kites nested in two of the drought-related habitats, Lake Kissimmee and Lake Tohopekaliga, the first records of breeding on these lakes. Nesting was observed on Lake Kissimmee (Fig. 2) along the old riverbed and in the first cove on the east side just north of the SR 60 bridge. In 1981, a fledgling was seen with 12 adult kites but in 1982 up to 25 kites attempted 17 nests, fledging 5 young. Breeding was first documented on Lake Tohopekaliga in 1982 near Goblet's Cove where 32 kites built 39 nests, fledging 19 young. Kite populations on each lake declined to six or fewer birds during fall and early winter months when nesting had terminated.

Most habitats used by kites during the drought (Table 1) were quite different from the typical Everglades or lake marshes that kites use during wetter periods (Sykes 1983). Kites were most frequently observed along urban (Fig. 2), roadside, or agricultural canals. A few rivers in central Florida provided temporary refuge for scattered individuals. Small (2-5 ha) permanent and seasonal wetlands also were used frequently. In addition, very small (2 ha or less) artificial marshes such as borrow pits, shell ponds and farm ponds supported a few birds for short periods.

Areas Without Kites

Snail Kites were not observed in other potential central Florida habitats searched during the height of the drought by Beissinger (Table 2). Most of these areas did not have marshes suitable for foraging by kites, and snail populations probably were low.

Fig. 2. Two drought-related habitats used extensively by Snail Kites. Top. Lake Kissimmee (Osceola Co.) where breeding was documented in the willow border indicated by the arrow. Note the extensive foraging habitat in the foreground. Bottom. The M-1 Canal in Royal Palm Beach (Palm Beach Co.) where kites often were observed foraging during the height of the drought in 1981.

TABLE 2. Areas searched in Florida in 1981 where no Snail Kites were observed. Locations appear in the appendix. Apple snail densities were judged by the presence of egg clusters.

No.	County	Habitat	Date	Snails
1	Alachua	Lake Orange & Area	18 June	Few
2	Citrus	Tsala-opoka Lakes	16 June	Few
3	Citrus	Withlacoochee R.	17 June	Few
4	Marion	Rodmans Reservoir	18 June	Common
5	Osceola	Cypress Lake	7 June	Few

KITE SIGHTING PROGRAM

Between June 1981 and September 1982, 155 sightings of Snail Kites were reported, 84% of which were judged to be reliable. The remainder included 13% that we judged to be of another species and 3% that had insufficient information. The most common misidentification was of the American Swallow-tailed Kite.

Over 55% of the sightings were reported by employees of government agencies, usually trained biologists or game wardens, and 97% of these were judged to be reliable; another 5% were observations made by the general public that were referred to the hotline by government employees. Many of the reports received from the general public were from experienced birders and naturalists. However, only 40, or 65%, of the 62 sightings reported by the general public, were verified to be of Snail Kites.

DISCUSSION

HABITAT USE AND DISPERSAL

As a result of drought conditions in southern Florida in 1981-82, massive dispersal of Snail Kites occurred. In 1981, kites were still concentrated in primary habitats. Movement was high during winter when water levels were nearly 1 m below normal. Massive dispersal away from primary habitats began in May with the onset of severe drought conditions and all primary areas dried. After flooding in August by Tropical Storm Dennis, kites returned to CA3A but not to the other primary areas. Massive dispersal occurred again in 1982 when water levels in southern Florida reached lows in April and May. Despite reflooding of primary areas in June, kites did not return immediately. The frequency of sightings

of kites reflected these two dispersal periods; sightings peaked from June-August 1981 and May-June 1982. Few sightings were reported in fall 1981 or winter 1982 when kites were concentrated in CA3A.

The only primary area receiving significant kite use in 1982 was CA3A. Of the three primary areas, CA3A was dry for the shortest duration, only four months compared to over a year for Lake Okeechobee. Because prolonged flooding of a marsh may be needed to sustain apple snail populations (Sykes 1979), snail survival during drought probably is inversely related to the length of the dry period. The nearly exclusive concentration of kites in CA3A in winter 1982 may reflect higher snail survival rates, higher pre-drought snail populations, or both.

Kites dispersed to two major regions (Fig. 1), the central lakes (Lake Tohopekaliga and Lake Kissimmee) and the east coast corridor (canals and seasonal or permanent wetlands in Broward, Palm Beach, and Martin Counties). Nearly a quarter of the known population in 1982 reached the central lakes (Beissinger unpubl.). This area not only provided survival habitat but snail populations were high enough to enable breeding to proceed. Although these were the first breeding records, it seems likely that central Florida always was an important refuge for kites during drought conditions because lakes in this region are permanent bodies of water capable of supporting snail populations even during low water conditions. The east coast corridor supported many scattered small groups of kites. Although much of the natural habitat in this region has been drained and developed, it has the highest rainfall in southern Florida (Thomas 1974), and kites might expect to find some wet areas here when most others are dry. The movement by kites to the east coast corridor during the 1981-82 drought, despite little marsh habitat remaining in this region, may be the result of a historical behavior that was strongly selected for during past drought conditions.

Lake Okeechobee was an important habitat for survival during the first year of drought. Kite numbers remained high through summer 1981, but prolonged low water conditions through spring 1982 resulted in little kite use. During the height of the drought, most sightings were along perimeter canals. Lake Okeechobee was an important kite refuge during the less severe 1971 drought (Chandler and Anderson 1974) and historically was probably an important refuge during dry seasons since at least some marsh areas always remained wet. In addition, Lake Okeechobee may

be a stop-over for kites that make their way north from the Everglades region into the central lakes.

The Headwaters of the St. Johns and the Loxahatchee National Wildlife Refuge were the only secondary areas that kites used during the height of the drought. Although one breeding pair was noted on the St. Johns, only a few kites were found there. Kites did not remain long at Loxahatchee and seemed to be passing through on their way to other east coast corridor habitats. Sightings in both of these areas occurred mostly at perimeter canals or impoundments rather than in the larger interior areas.

During the height of the drought in summer 1981, kites were seen most frequently in canals, especially in urban and agricultural areas and along roadsides. When water levels were finally replenished in 1982, sightings in small seasonal marshes increased. Kites were willing to move great distances and use very small patches of suboptimal habitats to survive the dry period.

Two key factors work directly or indirectly against kite survival in drought-related habitats. (1) Movement by kites from Everglades wilderness into more urban areas increases contact with humans. As kites are unwary of intruders when away from nest sites, they are easily shot and our data document at least two probable shootings in Palm Beach County (at locations No. 39 and 41 in Table 1). A publicity program conducted to increase public awareness of the kite's plight during drought periods could help alleviate shootings. (2) The amount of seasonal marshes has been decreasing because of drainage and development. Several marshes utilized by kites during this study are due for development in the near future (H. Johnson pers. comm.). We believe that our data show that these areas are important for kite survival during Florida's cyclic droughts and need to be preserved to insure survival during these periods.

Unfortunately, a quantitative analysis of the habitats used by kites during the 1981-82 drought is too difficult because of data biases. Sightings reflect areas that are frequented by people, such as roads, canals, and lakes. More remote areas such as permanent marshes received less coverage by observers and are probably underrepresented in our data. We also noticed that the effectiveness of our publicity increased with time as nearly 1.6 times as many sightings were received in 1982 as in 1981.

Kite Sighting Program

The Everglade Kite Sighting Program proved to be an effective means of obtaining information on the dispersal of the kite population. Sightings revealed much about the extent and timing of dispersal. In addition, the program was used to supplement annual kite censuses conducted by biologists. Only a minimal amount of time and expense was required to procure the information.

The effectiveness of any sighting program is dependent upon observer accuracy and proper publicity. A strong verification process is needed in light of a substantial number of erroneous reports that may be received. Evaluation of multiple factors, such as appearance, behavior, habitat, and observer experience, was crucial to the verification process that we used in this study and is highly recommended for others involved in similar efforts with sighting programs. Publicity was aimed at reaching people that most likely would recognize kites and subsequently report sightings. Aside from the general public and Audubon members, special attention was given in this study to notifying personnel in regional, state, and federal agencies. Because sightings from employees of governmental agencies, many of whom were trained biologists, comprised well over half of those obtained by our sighting program, we suggest that other sighting programs should actively pursue this relatively reliable source of information. Due to its initial success, the Everglade Kite Sighting Program presently is being continued at Loxahatchee National Wildlife Refuge.

Summary

In response to extended drought conditions in 1981-82, Snail Kites dispersed throughout the Florida peninsula. The timing of dispersal was related to dropping water levels at the onset of drought conditions. Sightings indicated that most kites moved to Lake Okeechobee (in 1981), the central lakes (in 1982) and the east coast corridor (in 1981 and 1982). Only Conservation Area 3A, which had the shortest period of dry-out, supported significant numbers of kites during higher water conditions in winter 1982. During the height of the drought, urban, roadside and agricultural canals attracted many small groups of kites or scattered individuals and were the most frequent sighting spots. Kites moved great distances to utilize very small patches of suboptimal habitat to survive the dry period. A sighting hotline was used successfully to document the dispersal of kites, and suggestions for the implementation of "hotlines" in gathering distributional data are discussed.

Acknowledgments

This work was supported by the United States Fish and Wildlife Service Cooperative Agreement No. 80-1012 with assistance from the Frank M. Chapman Memorial Fund of the American Museum of Natural History, and a Rackham Dissertation Grant from the University of Michigan. We wish to thank O. Ballow, C. Glynn, D. Jickling, M. Lansing, P. Moore, M. Reeves, and M. Stein for field assistance; Noel Chandler, Don Hampton, Even Rude, and Stephen Schneider for helping to keep the airboat running; Dan Carey, Mike and Kathy Collopy, Bill and Doris Hendricks, Billie Levine, Bob Payne, and Bill Wise for accommodations on the road; and Bonnie Hink for piloting. We are grateful to Herbert W. Kale II, James A. Kushlan, and Paul W. Sykes, Jr. for reviewing a draft of this manuscript. Special thanks go to the following people who helped funnel kite sightings to our hotline: Paul W. Sykes, Jr., Oron L. Bass, Jr., Don A. Wood, Robert V. Horsley, James A. Rodgers, Jr., and David R. Swift.

We are indebted to the following observers who reported Snail Kite sightings to our hotline: Lamont Alberts (LA); Mike Allen (MA); James Baker (JB); Oron L. Bass, Jr. (OLB); Donna Bickle (DB); Wally Boz (WB); B. Carey (BC); Daniel M. Carey (DMC); Neil Carper (NC); Patricia A. Carrington (PAC); Charles Chaffin (CC); Noel Chandler (NAC); Rod Chandler (RC), Frank and Carolyn Christian (FCC); William B. Courser (WBC); Doug Cuillard (DC); Eugene Danaher (ED); Fred Dayhoff (FD); Bernice DeSantos (BD); Walter Dineen (WD); Jack Dodge (JD); Mary Dodge (MD); Bill and Helen Dowling (BHD); Marge Eaton (ME); Bonnie Findley (BF); Paula Frohring (PF); Atha Green (AG); Philip Harrison (PH); Mike Hein (MH); Brian Hope (BH); Joan Hope (JH); Fred Hoph (FH); Robert V. Horsley (RVH); George Houghton (GH); Steven Hutman (SH); Roy Ingleston (RI); Dave Jickling (DJ); Haynes Johnson (HJ); Herbert W. Kale, II (HWK); Randy Kester (RK); Joyce Kleen (JK); T. H. Koundakijan (THK); Howard Langridge (HL); Bill Loftus (BL); Todd Logan (TL); Manuel Lopez (ML); Lorne Malo (LM); Robert Martens (RM); Steve Matzkow (SM); Ervin McIntosh (EM); D. McNiven (DM); Carl Middleton (CM); Frank Montalbano (FM); Peter Rhodes Mott (PRM); Roy Neal (RN); Burkett S. Neely, Jr. (BSN); Larry Nunn (LN); Karl Overman (KO); Steve Parry (SP2); Gail B. Parsons (GBP); Barbara Patty (BP); Robert Payne (RP); Steve Pilbeam (SP1); Harold Quincy (HQ); Jean Quincy (JQ); Tim Regan (TR); Pat Reynolds (PR); Stuart Reynolds (SR); Ginger Roberts (GR); James A. Rodgers, Jr. (JAR); Leslie Rowse (LK); James L. Shortemeyer (JLS); Joyce Smith (JS); David Smith (DS); Terry Smith (TS); Richard Stallcup (RS); David R. Swift (DRS); Paul W. Sykes, Jr. (PWS); Margaret Teahan (MT); Robert Townsend, Sr. (RT); Ruth S. Trumpower (RST); Jonathan Turner (JT); Chandler Vincent (CV); John D. West (JDW); Charlie Wetzell (CW); John Whitworth (JW); Gordon Woolfram (GW), Mike Zaske (MZ); and Cindy Ziobron (CZ).

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Appendix

Locations followed by observer's initials in parentheses (see Acknowledgments section for a key to observers) for drought-related sightings (Table 1) and areas without kites (Table 2) by number.

Table 1: 1. Butler Rd. S of Hillsboro Blvd. and E of Turnpike (RK); 2. 28 km E of Naples on N side of US 41 (DMC); 3. N of US 41 and S of Jetport training strip (DMC); 4. Turner River 1.5 km N of US 41 and 16 km W of Monroe Station (DMC); 5. S of US 41 near Shark Valley entrance to Everglades N.P. (DMC); 6. C-111 canal 1 km W of SR 27 (DMC); 7. Big Cypress National Preserve on Eleven Mile Rd. 1 km N of US 41 (DS); 8. Near Krome Ave. and US 41 intersection (DMC); 9. E edge of Big Cypress National Preserve on W side of L-28, N of US 41 (MS); 10. Suwanee River 200 m S of Fanning Spring, Levi Co. in a canal on the Dixie Co. side of the river (CC); 11. Lake Hicpochee 8 km S of Moore Haven (SRB, RP, DB, TR, JAR); 12. 5 km W of Moore Haven on the N side of US 27 (RS); 13. Caloosahatchee River on N side of SR 80 11.5 km W of Moore Haven (LN); 14. 12 km W of Clewiston on S side of US 27 (SRB); 15. 3 km W of Clewiston on S side of US 27 (HQ, JQ); 16. E side of SR 80 near intersection of US 27 and SR 80 (ME); 17. Lake Istokpoga at inflow of Arbuckle Creek (SRB,

RM); 18. Intersection of SR 581 and Trout Creek Rd. N of Tampa (WBC, ML, GBP); 19. Directly NW of SR 60 and SR 512 (SRB, RC, NAC, HWK); 20. E side of Turnpike 19.5 km S of Fort Drum Plaza (DJ); 21. Caloosahatchee River near confluence with Hickey Creek (SR) :22. E side of SR 711 between 5 and 6.5 km N of the intersection with SR 706 (HJ, RST, MT); 23. SR 711 S of junction with SR 708 (JD, MD); 24. Big Cypress National Preserve along an airboat trail 1.5 km S of Pinecrest and the Loop Rd, N of Doctor Tiger's Hammock and W of Ben Hess Head (FD); 25. SR 441 2 km S of Okeechobee city limits on W side (RC); 26. St. Johns River just N. SR 50 bridge and Tosahatchee State Preserve (FH); 27. W side of Turnpike 6 km N of Kissimmee/St. Cloud exchange (RVH); 28. Lake Kissimmee 0-2 km N of SR 60 bridge and also 6-7 km NE of the boat landing at Co. Rd. 523A (SRB, FM, JAR); 29. Lake Tohopekaliga near Goblet's Cove (GW, SRB, JAR); 30. Jupiter Farm Rd. S of SR 706 and W of the Turnpike (RN); 31. N side of SR 704 adjacent to the S end of the West Palm Beach Water Catchment Area (RVH); 32. 1.5 km W of US 441 between Lake Worth and Lantana, W of Homeland entrance (FCC); 33. W of Jupiter on S side of SR 706, 1 km E of intersection with SR 711 (HJ); 34. West Palm Beach E side of US 441 between 704 and Belvedere Rd (RVH); 35. Callery-Judge Citrus Grove on Seminole Pratt-Whitney Rd., N of SR 80 and E of Lion Country Safari (GR); 36. C-18 boat ramp near PGA Blvd. bridge, 3 km W of Turnpike (LA); 37. Whitworth Farms E. of US 441 and 2.5 km S of intersection with SR 804 (JW, JET, SRB—See Takekawa and Beissinger 1983); 38. NW of Loxahatchee N.W.R. and L-7, 3 km SW of Twenty Mile Bend (SP2, JT); 39. West Palm Beach Canal, S of SR 80 (Southern Blvd) near Pioneer Rd. between the Florida Turnpike and US 441 (BF); 40. M-1 Canal (Fig. 2) in Royal Palm Beach, S of Okeechobee Blvd., W of Strathmore Gate and Indian Trail Villas (DRS); 41. 3 km portion of the M-1 Canal in Royal Palm Beach, parallel to 130th Ave N and 40th St, 3.5 km NW of the intersection of U.S. 441 and Okeechobee Blvd (SR 704) (RVH, JET, SRB, CZ); 42. North Palm Beach along the Florida Turnpike, between 4 km N of SR 704 (Okeechobee Blvd) exit and just N of SR 702 (45th St) (JB, SRB, BD, JET, RVH, BSN, PRM, RI); 43. Savannas County Park (SR 712 and Weatherbee Rd) (MD); 44. Lake Woodruff N.W.R. in impounded pools W of Spring Garden Lake (NC); 45. Lake Woodruff N.W.R. 1.5 km S of Lake Woodruff on Scoggin Creek (SRB); 46. Lake Woodruff N.W.R. on Spring Garden Creek 1.5 km N of refuge impoundments (NC).

Table 2: Lake Orange, Cross Creek, and Lochloosa near Evinston; 2. Henderson, Craft, Spivey, and Davis Lakes near Inverness and Hernando; 3. 25 km section between SR 44 and S 200; 4. R24-25 E, T11S; 5. 6.5 km S of Lake Tohopekaliga.

NOTES

First evidence of Snail Kites feeding on the introduced snail, Pomacea bridgesi, in Florida.—The Snail Kite (*Rostrhamus sociabilis*) is a specialized feeder on *Pomacea* spp. snails throughout its range (Howell 1932, Haverschmidt 1962, Snyder and Snyder 1969, Beissinger 1983, Snyder and Kale 1983). In Florida, kites feed almost exclusively on *Pomacea paludosa* and observations of non-snail prey are extremely rare (Sykes and Kale 1974, Woodin and Woodin 1981). Turtles are the most common non-snail food item eaten during droughts (Beissinger in prep.). This note documents the first evidence of kites feeding on a second species of *Pomacea* in Florida, *Pomacea bridgesi* (Reeve), an introduced species commonly known as the mystery snail.

From mid-May through 10 June 1982, John Whitworth (pers. comm.) reported Snail Kites feeding in a flooded agricultural field and surrounding ditches on Whitworth Farms in southeastern Palm Beach County (Beissinger and Takekawa 1983). On 11 June 1982, we observed one kite capture three large *Pomacea* sp. at this site and then perch in a low shrub over an irrigation ditch to extract and consume them. We were unable to recover these snail shells but found an abundance of other shells, live snails and egg clusters that indicated that the only *Pomacea* species present was *P. bridgesi*. We found no evidence of *P. paludosa* in three thorough searches of the field while it was slowly draining.

P. bridgesi was introduced from Brazil for the aquarium trade and has escaped into canals and ponds in Dade, Broward, Palm Beach, and Alachua Counties (F. G. Thompson pers. comm.). It was first reported to us in small canals in Delray Beach (Mark Sanders pers. comm.). We have found it in several disturbed habitats in Palm Beach County.

P. bridgesi is similar in appearance to *P. paludosa* but has a raised, very pointed spire rather than a rounded apex. It has more pronounced stripes on the shell and is more purple than the brown color of *P. paludosa*. Eggs are much smaller (approximately 2 mm vs 4.4 mm) and are laid in a hard, consolidated cluster of several hundred eggs, rather than the average 28 eggs of *P. paludosa* (Hanning 1978). Clusters contain several layers of eggs and do not have a spiraled pattern. As in *P. paludosa*, clusters are laid at night on emergent vegetation above the surface of the water.

Newly hatched *P. bridgesi* are much smaller than young apple snails. Their small size may allow them to disperse more readily into new waterways, as the hatchlings could be more easily carried by water currents. Such an ability to quickly colonize disturbed habitats might explain why *P. bridgesi* is mostly found in habitats in Florida where *P. paludosa* rarely occurs.

Little is known about the life history of *P. bridgesi* in Florida. Nothing is known about the effects of cold winters or water quality on *P. bridgesi* or its competitive interactions with *P. paludosa*. We have found *P. bridgesi* in canals with *P. paludosa* and in agricultural fields with another introduced snail, *Marisa cornuarietis*. Although the latter was recently documented by Snyder and Kale (1983) as a food item of kites in Columbia, we have yet to see kites eat them in Florida. Continued spread by *P. bridgesi* populations in southern Florida could benefit kites by providing many hectares of foraging areas in disturbed habitats as occurs in rice fields in South America (Beissinger 1983).

Because disturbed habitats are constantly being manipulated, they might be stable for a long enough period to offer short-term food supplies for kites, but may be disturbed too often to support kites through a four month breeding season.

We would like to thank John Whitworth who alerted us to the presence of kites on his property and graciously granted us access.

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Florida Field Naturalist 11: 107-108, 1983.

The Snail Kite in the southern Everglades.[1]—The Snail Kite (*Rostrhamus sociabilis*) is considered to be a characteristic species of the Florida Everglades, as emphasized by its former common name, the Everglade Kite. Although the Kite occurs commonly in the northern Everglades, especially in Loxahatchee and Conservation Areas 2 and 3 (Sykes 1984), it seems not to be common in the southern Everglades. In this paper, we review the historic and present status of the Snail Kite at the extreme southern part of its Florida range, the southern Everglades in and near Everglades National Park. We find that it has generally been uncommon there and report its first recent nesting in the park.

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[1]Editorial processing of this manuscript was handled by Associate Editor William B. Robertson, Jr.

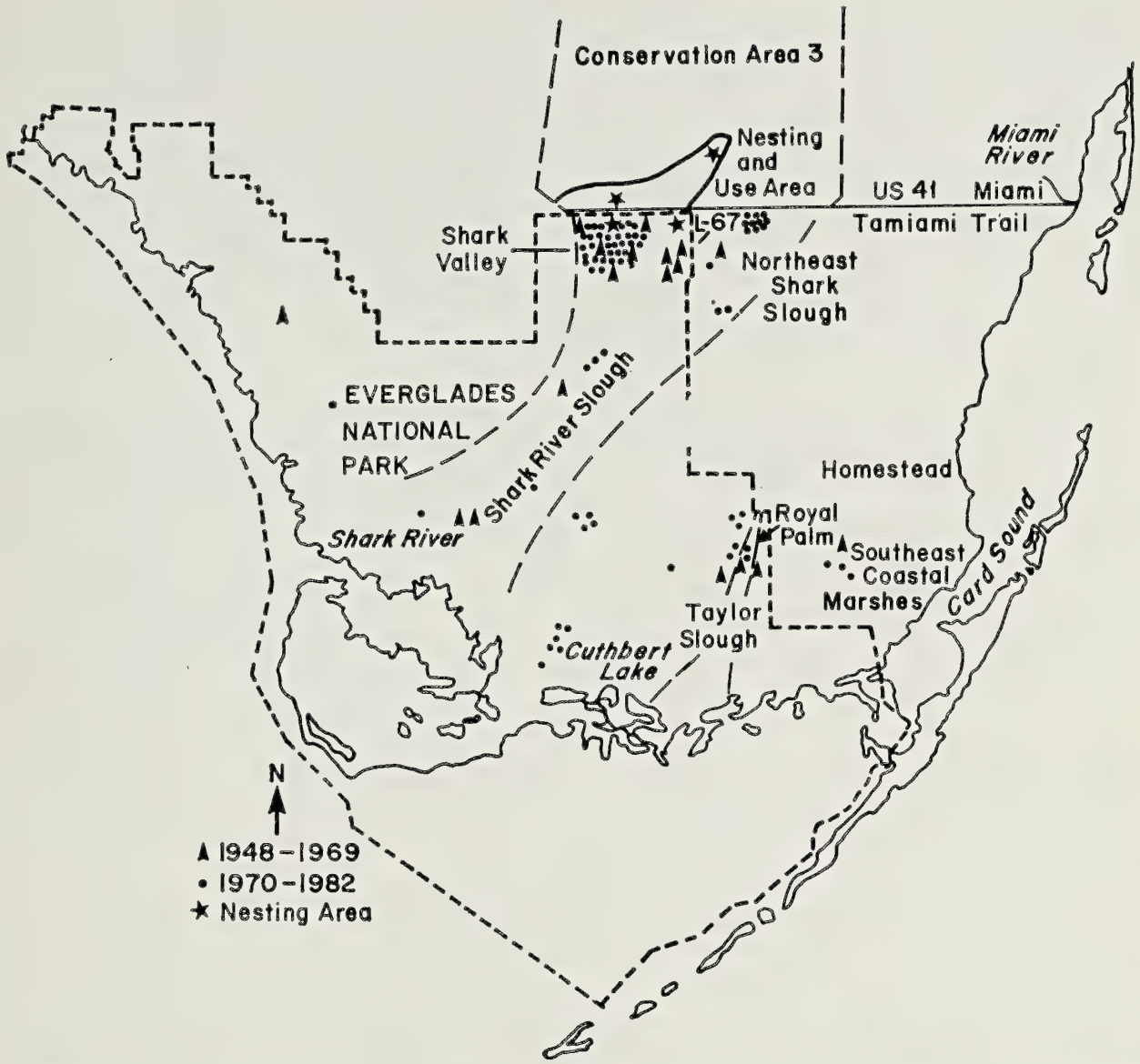

Fig. 1. Location of observations of Snail Kites in the Southern Everglades, 1948-1983.

Our evaluations are based on a review of the literature and on records collected at Everglades National Park since 1948. We also use observations made on annual Kite surveys conducted by P. W. Sykes, Jr., and J. A. Rodgers (pers. comm.) and a helicopter survey made with S. R. Beissinger on 20 February 1981. The area we discuss is south of Tamiami Trail, U.S. 41 (Fig. 1). Sykes (1983, 1984) discussed the overall range of the Kite in Florida.

Many records of Snail Kite nesting in and near the southern Everglades are from the last century. Sykes (1984) made a thorough search of egg collections and found several clutches labeled from extreme south Florida including: five from "southwest of Miami opposite Key Largo" probably in the southeast coastal marshes collected in 1897; two 64 km "southeast of Miami" collected in 1902; seven from "Everglades", not necessarily the southern Everglades, from 1883 to 1916; and one from "Big Sawgrass" in 1907. The usual reference for Kite nesting in the southern Everglades, Bent (1937), ap-

pears tenuous. Bent reported that in 1904 "Everglade Kites were breeding commonly all through the southern Everglades, west of Palm Beach and back of Miami and Homestead; there was *even said* (emphasis added) to be a breeding colony of them near Paradise Key, now Royal Palm State Park", now Royal Palm in Taylor Slough, Everglades National Park. Before and around the turn of the century the Snail Kite did nest near the headwaters of the Miami River (Maynard 1881, Bent 1937, Howell 1932), where it was first discovered in Florida by Harris (1844). It appears that the last definitive records of Kites nesting in the southern Everglades were approximately 70 years ago. By 1918-19, Howell (1921) considered the Snail Kite to be rare in Taylor Slough.

Early records of individual kites in the southern Everglades include birds at Harney River Headwaters in 1897 (Willoughby 1913), Card Sound in 1899 and Big Sawgrass in 1902 (Sykes 1984), Cuthbert Lake in 1903 (Dutcher 1904), Taylor Slough in 1918, 1919, 1928 (Howell 1921, 1932), northeast of West Lake in 1934 and Shark River headwaters in 1935 (Sykes 1984). Observations of Kites in the southern Everglades since 1948, the establishment of Everglades National Park, are shown in Fig. 1. Eighteen sightings through 1969 were in Taylor Slough, the southeast coastal marshes, Shark Valley and Shark Slough, L-67 Canal, the headwaters of coastal streams and northeast Shark Slough. These were the same areas in which Kites were seen between 1970 and 1982, suggesting that use of traditional areas has not changed. From 1977 to 1982, we made specific efforts to document Kite occurrences. Thus most of our observations were from the period of time when the population was increasing (Sykes 1984) and high water conditions prevailed.

High water conditions seem to coincide with increasing use of the southern Everglades in that Kites are not present there during droughts (Beissinger and Takekawa 1983). Although Kites have been reported in the southern Everglades each month, 60% of the records are from winter, November to February, before the nesting season. Kites were most commonly seen at Shark Valley, immediately south of the current nesting areas in Conservation Area 3 (Fig. 1).

In 1983, four nesting attempts were observed in the Shark Valley area by Steven R. Beissinger and Lisa Pakula (pers. comm.). Two of these nests fledged young. This first recent nesting occurred during a period of exceptionally high water. Both successful nests were outliers of the nesting colony located 200 m to the north in Conservation Area 3.

The Snail Kite appears to be an uncommon, primarily winter, resident of the southern Everglades occurring there principally during periods of exceptionally high water and confined mostly to the extreme north, adjacent to its current area of greatest abundance in southern Conservation Area 3.

We thank Steven Beissinger, Lisa Pakula, James Rodgers, and Paul Sykes for supplying information, Paula Frohring for help in data search, and Paul Sykes whose review significantly improved the paper.

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Florida Field Naturalist 11: 108-111, 1983.

Parasites of the Snail Kite in Florida and summary of those reported for the species.—The Snail Kite (*Rostrhamus sociabilis*) ranges from Florida, Cuba, and southeastern Mexico south to southern South America (Hellmayr and Conover 1949, Friedmann 1950, Sykes 1984). Here we report for the first time the parasites of *R. s. plumbeus* in Florida and list parasites known for the species elsewhere. Our findings were not the result of a detailed study but were an adjunct to a broader research effort on Snail Kite ecology.

Ectoparasites, fresh fecal samples, and blood smears were collected from nests and nestling Snail Kites in Florida, as the opportunity arose, from 1969 through 1975. We collected 38 samples in Conservation Area 2A, Broward County (2 ectoparasite collections), Lake Okeechobee, Glades County (13 blood smears, 10 fecal samples, 1 ectoparasite collection), and headwaters of the St. Johns River, Indian River and St. Lucie counties (6 blood smears, 1 fecal sample, 5 ectoparasite collections). Techniques of preparing, culturing, and examining samples followed Forrester et al. (1974). No necropsies were performed for endoparasites. No material was obtained from birds capable of flight because we felt that the stress of capture was too great a risk in the relatively small population in the 1969-1975 period.

R. sociabilis is a known host for 11 species of ectoparasites (9 biting lice, 1 mite, and 1 beetle) and 6 endoparasites (5 flukes and 1 protozoan) (Table 1). All blood smears were negative for blood protozoans. Two fecal samples from nests at Lake Okeechobee, Glades County, in 1974 and 1975 contained oocysts

TABLE 1. Parasites for which the Snail Kite (*Rostrhamus sociabilis*) is a known host.

Parasite	Substrate on host	Locality of host	Reference
Ectoparasites			
Mallophaga (biting lice)			
Craspedorrhynchus obscurus (Giebel)[1]	feathers	Argentina	Lahille 1920, Guimaraes 1943
Craspedorrhynchus obscurus	feathers	Colombia	Carriker 1956
" "	feathers	North America	Malcomson 1960
" "	feathers	Guyana	Bodkin and Cleare 1916
Degeeriella sp.	feathers	Guyana	"
Columbicola columbae (Linnaeus)[2]	feathers	Guyana	"
Menacanthus sp.	feathers	Guyana	"
Neocolpocephalum flavescens	feathers	Not known	Eichler 1937
Colpocephalum maculatum Piaget	feathers	Guyana	Bodkin and Cleare 1916
Colpocephalum ibicter (Eichler)	feathers	Guyana	Price and Beer 1963
Colpocephalum turbinatum Denny[3]	feathers	Surinam	"
Colpocephalum turbinatum Denny	feathers	Cuba	"
Colpocephalum turbinatum Denny	feathers	Guyana	Bodkin and Cleare 1916
Colpocephalum turbinatum Denny	feathers	Florida	This paper
Falcolipeurus quadriguttatus (Giebel)	feathers	North America	Malcomson 1960
Falcolipeurus quadriguttatus (Giebel)	feathers	Florida	This paper
Acarina (mites and ticks)			
Ornithonyssus bursa (Berlese)	feathers, nests	Florida	This paper

Parasite	Substrate on host	Locality of host	Reference
Coleoptera (beetles)			
Dermestes nidum	skin & muscle tissues ventral side of nestlings, nests	Florida	Snyder et al. (in press)
Endoparasites			
Digenea (flukes)			
Echinostoma armatum Fuhrmann	intestines	Brazil	Fuhrmann 1904
Notocotylus lopezneyrai Dubois and Pérez Vigueras	intestines	Cuba	Dubois and Pérez Vigueras 1953
Prionosoma malacophilum Pérez Vigueras	intestines	Cuba	Pérez Vigueras 1944
Bothrigaster variolaris (Fuhrmann)[4]	abdominal cavity & intestines	Brazil	Fuhrmann 1904 Travassos 1923
Bothrigaster variolaris (Fuhrmann)	"	Cuba	Dubois 1959
Bothrigaster variolaris (Fuhrmann)	nasal fossa & sinuses	Cuba	Pérez Vigueras 1940, 1955
Unidentified to species	lungs	Not known	Grossman and Hamlet 1964
Coccidia (parasitic protozoans)			
Coccidia *Eimeria* sp.	intestinal epithelium & feces	Florida	This paper

[1]*Philopterus obscurus* Giebel is a synonym of *Craspedorrhynchus obscurus.*
[2]*Lipeurus baculus* N. is a synonym of *Columbicola columbae.*
[3]*Colpocephalum dissimile* Piaget is a synonym of *Colpocephalum turbinatum.*
[4]*Ophthalmophagus variolaris* Dubois and *Spaniometra variolaris* (Fuhrmann) are synonyms of *Bothrigaster variolaris.*

of an *Eimeria* coccidian. Although the six oocysts found were insufficient to attempt a description, they likely represent a new species, because no published reports of coccidia from the Snail Kite exist and coccidia are among the most host-specific parasites.

Biting lice, *Colpocephalum turbinatum* and *Falcolipeurus quadriguttatus*, have been reported on Snail Kites outside the United States but were not previously known from kites in Florida. We obtained both from nestlings on the headwaters of the St. Johns River, Indian River County. Four species of biting lice listed in Table 1 are primarily parasites of non-raptors, so their occurrence on Snail Kites is interesting. *Columbicola columbae* is primarily found on Columbiformes, *Menacanthus* spp. on Galliformes, Piciformes, and Passeriformes, and *Colpocephalum ibicter* and *C. turbinatum* on Columbiformes (Bodkin and Cleare 1916, Price and Beer 1963). We believe Snail Kite interactions with other avian species are the source of contamination by these non-raptorial parasites. Contamination probably occurs at communal mixed species roosts where there is momentary contact with other birds and falling feathers. Another possible source of contamination is contact with antagonistic passerines. In Florida, Eastern Kingbirds (*Tyrannus tyrannus*) and male Red-winged Blackbirds (*Agelaius phoeniceus*) in aggressive defense of their breeding territories will on occasion alight for several seconds on the back of a Snail Kite as the raptor flies slowly past. Boat-tailed Grackles (*Quiscalus major*) often attempt to steal apple snails (*Pomacea paludosa*) from kites while the kites perch to feed, affording an opportunity for contact. Similar contacts with other species of birds probably occur throughout the range of the Snail Kite.

A Snail Kite nest in the northern part of Cloud Lake (Minute Maid) Reservoir in northeastern St. Lucie County contained two young on 26 April 1974, estimated to be one and three days old. By 14 May only one nestling was alive and remains of its sibling were lodged in the side of the structure, having died about 14 days before. The surviving nestling was weak, and the bird and its nest were swarming with thousands of mites. On 21 May the nest was empty, still heavily infested with mites, and the lone nestling was assumed to be dead. The mites collected on 14 May were tropical fowl mites (*Ornithonyssus bursa* (Berlese), Family Macronyssidae). This is the first time this ectoparasitic mite has been found on *R. sociabilis* although it occurs on poultry, sparrows [probably the House Sparrow (*Passer domesticus*)], myna, and man. It is capable of killing newly hatched chickens and adult birds (not specified but presumably chickens) (Baker et al. 1956). *O. bursa* is distributed throughout warmer regions and has been reported in Florida and other eastern states (Baker et al. 1956). We attribute the failure of the above nest to heavy infestation of *O. bursa*. From time to time in southern Florida we have observed other kite nests that contained large numbers of brown and red mites. In 1969, a nest in eastern Conservation Area 2A (Broward County) of the Everglades was heavily infested with mites, and the three nestlings did not survive. We believe the death of these young was related to the mite infestation.

More parasite work is needed on the Snail Kite, particularly for endoparasites. In that snails are intermediate hosts for many parasitic organisms and Snail Kites generally feed exclusively on several species of these mollusks (in Florida usually only on *Pomacea paludosa*), their potential for parasite infection would appear to be high, especially for infection with flukes.

We thank William Phillis and K. C. Emerson for identifying the mites and biting lice, respectively, and Marshall A. Howe for the German translation. The technical assistance of Pamela P. Humphrey is gratefully acknowledged.

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Florida Field Naturalist 11: 111-116, 1983.

Two species of mosquitoes feed on Snail Kites in Florida.—On 30 April 1969, while routinely checking the nesting progress of Snail Kites (*Rostrhamus sociabilis plumbeus*) in eastern Conservation Area 2A of the Everglades, Broward County, Florida, I discovered that at one nest mosquitoes were having a blood meal on three nestlings 12 to 14 days old. At 0810, I collected several adult female mosquitoes while they were feeding on the exposed skin near the base of the birds' bills. The sky was clear at the time. The mosquitoes were identified at the Florida Medical Entomology Laboratory at Vero Beach as *Anopheles crucians* and *A. walkerii.* No mosquitoes have previously been identified as parasites of the Snail Kite in Florida. Furthermore, these two culicids almost never feed in daylight, even when they are placed on a host on which they readily parasitize at night (H. W. Kale, II pers. comm.). A number of species of *Anopheles* mosquitoes are transmitters of avian and mammalian malaria parasites (Garnham, 1966. Malaria parasites and other Haemosporidia. Oxford, England, Blackwell Sci. Publ.; Greiner, E. C. et al. 1975. Distribution of the avian hematozoa of North America. Can. J. Zool. 53:1762-1787). Whether *R. sociabilis* is susceptible to avian malaria is not known. There are undoubtedly other species of mosquitoes in Florida that use Snail Kites as hosts, but they remain to be documented.

I express my appreciation to Hilda Lynn for identification of the mosquitoes and to Herbert W. Kale, II for making arrangements for the identifications.

Paul W. Sykes, Jr., U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Field Station, P. O. Box 2077, Delray Beach, Florida 33444 (Present address: U. S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Southeast Field Station, School of Forest Resources, University of Georgia, Athens, Georgia 30602).

Florida Field Naturalist 11: 116, 1983.

REVIEW

Everglade Kite recovery plan.—Thomas Martin, Alexander Sprunt, IV, Paul W. Sykes, Jr., Lovett E. Williams, Jr. (Leader), 1983, Atlanta, Georgia, U.S. Fish and Wildlife Service, 51 pp., available from U.S. Fish and Wildlife Service, Unit i, 3840 York Street, Denver, Colorado 80205.—This report is the official plan for the conservation and management of the Snail Kite, as approved by the U.S. Fish and Wildlife Service, written by the Everglade Kite Recovery Team. As in most such teams, the members were appointed primarily as representatives of the government agencies responsible for conservation of the kite. Thomas Martin was manager of the Loxahatchee Wildlife Refuge, where considerable effort has gone into creating kite feeding habitat; Alexander Sprunt represented the National Audubon Society whose wardens patrol kite habitat near Lake Okeechobee; and Lovett Williams represented the Florida Game and Fresh Water Fish Commission, the state agency responsible for endangered species. Paul Sykes of the U.S. Fish and Wildlife Service Patuxent Wildlife Research Center was the team member with extensive experience in biological research on the species. His studies from 1967 through 1982 formed much of the biological basis for the plan.

The team and the Fish and Wildlife Service took eight years from the Team's appointment to approval of its plan, a seemingly long time—at a little over six pages per year. However, little was lost during the planning period, as research on the kite by Sykes, Noel F. R. Snyder, Stephen R. Beissinger, Jean Takekawa, and Daniel Cary proceeded at a significant pace, all funded by the U.S. Fish and Wildlife Service, which can be credited for both its long-term commitment to and recent emphasis on the Snail Kite. Knowledge gained from these studies was incorporated into the plan, which is much more robust as a result.

Although the purpose of a recovery team is to write a plan, it also serves a more crucial function. The team provides a forum for discussing the biology and needs of the species and a mechanism for monitoring its changing status. For the teams with which I am familiar, the periodic convocation of knowledgable biologists, bureaucrats, and concerned citizens to discuss a species was an extraordinarily useful exercise. From this perspective it is unfortunate that the teams, which also function as advisors to Fish and Wildlife Service Regional Directors, are now being disbanded upon completion of their plans. Although a committee may not be the ideal way to write a plan quickly, a recovery team, through the deliberations of its members and consultants, is an effective guardian of a species' welfare.

The team states its view forthrightly that only by reclaiming now lost Everglades habitat might the salvation of the kite be assured. Recognizing that this is not possible, the team formulated alternative approaches, which it emphasizes may not be sufficient. It is the team's judgement that the kite may never again be secure in Florida, and that the species will always require management, will always be endangered, and may become extinct in Florida. In this way the team signaled an inability to fulfill its mandate to create a plan that would lead to the recovery and subsequent removal of the kite from the list of endangered species. The plans' goal therefore is less optimistic, although more realistic, to assure the existence of a secure Snail Kite population in Florida.

To this end the plan first summarizes the range, biology, and population status of the species. It notes that double brooding, serial polygamy, and long nesting season mean the kite has a relatively high reproductive potential for a raptor. The kite's dependence on snails is noted, but I find it difficult to understand why research on its nearly sole food has been so limited. The kite is nomadic, and, although evidence is lacking, might even move between Florida and Cuba, where the same subspecies occurs (Amadon 1983, Fla. Field Nat. 11: 69-72). Dispersed by the 1981 drought (Beissinger and Takekawa 1983, Fla. Field Nat. 11: 89-106) the population was estimated to be about 300 individuals as of 1982. Unfortunately the inadequacies of the census technique used in deriving such estimates are not discussed, although the plan does call for development of a standardized census technique.

Reasons for endangerment include shooting (thought not to be very important), exotic plants that cover open-water feeding habitat, and mostly water management. The adverse effects of the loss of previous Everglades habitat are unarguable. However the plans' conclusion that water management has shortened the wet cycles and worsened the effects of periodic droughts in the Everglades seems simplistic, as does its "three word" description of the needs of the kite, "reflood the Everglades." Actually some parts of the Everglades, such as Conservation Areas 2a and southeast 3a, are wetter now in most years than they used to be. The plan suggests that the only known management strategy is to make the Everglades a "permanent wetlands." If so the Everglades would cease to exist as assuredly as if it were dried out. The Everglades functions not by the maintenance of permanent high water but by dramatic seasonal and annual fluctuations that lead to a seasonal dry period.

To some extent this emphasis is a result of the single-species approach to resources management dictated by the nature of the team's charge, the "step-down" planning process, and the Endangered Species Act itself. Unfortunately what the kite needs from the Everglades, high permanent water levels, is exactly what has led the Wood Stork to the verge of its own listing as an endangered species. How did two such divergently-adapted species both survive in the primative Everglades? Undoubtedly because of temporal and geographical heterogeneity. Some years were wet kite years; some were dry stork years. In any year some part of the vast south Florida wetlands may have experienced unusually prolonged high water conditions, which were probably soon found by parts of the nomadic kite population. It is this variability that must be restored to the Everglades if kites and storks are both to avoid local extinction there.

The plan identifies steps to achieve the goal of a secure kite population including identifying its historic range, setting population goals, assessing and correcting limiting factors, identifying, restoring, and maintaining habitat, monitoring status, and maintaining inter-agency and public cooperation. Its principal thrust is to manage kite habitat by all available means. This includes any measure that would tend to prevent drought conditions including the establishment of binding agreements for habitat management to benefit the kite. This goal, if it were possible to implement, would turn all of the Everglades into a kite refuge. Could this really be desirable? Elsewhere in this issue, Sykes (1983, Fla. Field Nat. 11: 73-88) takes what appears to be a more flexible approach, with which I personally agree. He notes that man-

agement for a single species is neither practical nor desirable over most of the kite's range including Lake Okeechobee and the Conservation Areas. In most years these areas will provide some kite habitat. In addition selected "islands" of habitat scattered within the historic range should be intensively managed for the kite. He suggests that the kite population will be preserved only by the combined maintenance of the remaining large marsh systems in as close as possible to their natural conditions and the creation smaller refuges for use by kites during periodic droughts.

The difference in approach probably derives less from individual viewpoint than from the purpose and constraints of the single-species recovery planning effort. The authors of the plan have worked admirably and done a great service in catagorizing, analyzing, and prioritizing the needs of the Snail Kite and in composing a plan that conservationists and management agencies need to consider carefully in their planning efforts. It would be useful to continue the team or a successor in existence by some means to provide a forum for kite conservation. Lacking that, responsibility now rests entirely with state and federal agencies to assure the kite's continued existence in Florida, hopefully as part of a more naturally functioning Everglades ecosystem.—**James A. Kushlan**, Department of Biology, University of Miami, Coral Gables, Florida 33124.

Florida Field Naturalist 11: 117-119, 1983.

EDITORIAL

Acknowledgments—I greatly appreciate the generous assistance of the many people who helped the Florida Ornithological Society publish Volume 11 of the Florida Field Naturalist. I especially thank the authors for submitting their work and stoically seeing it through to publication. I also thank my special advisors who helped in numerous ways, especially Jack Hailman, Fred Lohrer, William B. Robertson, Jr. and Glen E. Woolfenden. I am grateful to those who accepted the important tasks of reviewing and advising me on the suitability of papers before their publication, including Dean Amadon, Lyn Atherton, Steven R. Beissinger, Margaret Bowman, Mary H. Clench, Robert L. Crawford, William Dunson, Shiela Gaby, Wally George, J. William Hardy, Jerome Jackson, Herbert W. Kale, II, James N. Layne, Paul Moler, Douglass H. Morse, John C. Ogden, Earl R. Rich, William B. Robertson, Jr., Henry M. Stevenson, Paul W. Sykes, Jr., Walter K. Taylor, Elliott Tramer, James Wiley, and Glen E. Woolfenden. I would also like to especially acknowledge those who worked so thoughtfully in putting together the special Snail Kite issue, Paul W. Sykes, Jr., Steven R. Beissinger, Dean Amadon, Lloyd Kiff, and Fred Lohrer. I thank Elaine Gentile for her fine typing. I wish especially to acknowledge the efforts of Fred Lohrer and Glen Woolfenden in producing the five-year index of the Florida Field Naturalist.—**James A. Kushlan**, Department of Biology, University of Miami, Coral Gables, Florida 33124.

HISTORICAL NOTE

Arthur H. Howell, author of Florida bird life, holding a wounded male Snail Kite he had shot in the St. John's Marsh at the headwaters of the St. John's River system Brevard County, Florida, in April, 1925. Photograph taken by Donald J. Nicholson, courtesy of the Western Foundation for Vertebrate Zoology, Los Angeles, California.

FLORIDA FIELD NATURALIST

Quarterly publication of the Florida Ornithological Society

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FLORIDA FIELD NATURALIST

QUARTERLY PUBLICATION OF THE FLORIDA ORNITHOLOGICAL SOCIETY

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The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 12, NO. 1 FEBRUARY 1984 PAGES 1-24

CURRENT STATUS AND MANAGEMENT OF GRAY BAT CAVES IN JACKSON COUNTY, FLORIDA

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The gray bat (*Myotis grisescens*) occupies a limited geographic range in limestone karst regions of the southeastern United States and is listed as endangered by the U.S. Fish and Wildlife Service. Human disturbance is a primary cause for the decline of the gray bat (Manville 1962, Barbour and Davis 1979), as is habitat destruction (Mohr 1972, Tuttle 1979). In Florida, gray bats are known to occur primarily in a small complex of caves in Jackson County (Humphrey and Tuttle 1978). Since 1967 three maternity caves in Florida, harboring over 40,000 gray and southeastern (*M. austroriparius*) bats, have been destroyed. At least four additional maternity caves, once occupied by 3,000-30,000 *Myotis* each, have been abandoned because of frequent disturbance (M. Tuttle pers. comm.). No action has been taken by any agency or individuals to secure the remaining known gray bat caves in Florida, although the Gray Bat Recovery Plan (US Fish and Wildlife Service 1982) identified these caves and recommended specific protective measures.

In this paper I assess the status of known gray bat caves in Jackson County, Florida, discuss the effort to locate additional gray bat caves, evaluate the management strategies recommended in the Gray Bat Recovery Plan for Florida caves, and discuss implementation of the management measures subsequently deemed appropriate for each cave.

METHODS

The study was conducted from June 1981 to March 1983. Information on gray bat caves in Florida before 1981 was obtained from M. D. Tuttle, Curator of Mammals, Milwaukee Public Museum. Gray bat caves were located with assistance from Gray Bat Recovery Team members, Florida State Cave Club members, Florida Department of Natural Resources (FDNR) and Florida Game and Fresh Water Fish Commission (GFC) personnel, private in-

dividuals, and university researchers. These sources were also queried for information on any previously undocumented bat caves. The scope of this study was confined to Jackson County where the majority of Florida's gray bat population is known to occur. Caves in central and north central Florida are not occupied by gray bats. These regions are too far from the suitably cold caves in Alabama and Tennessee to which Florida gray bats must migrate for hibernation (Humphrey and Tuttle 1978). Observers were stationed near cave entrances at dusk during the breeding season (mid-March through April) to determine if bats emerged. Because gray bats roosted with southeastern bats, we could not count species separately, nor could we estimate total populations in most instances because of the volume of bats emerging and density of the surrounding vegetation. When the presence of bats could not be documented any other way, certain caves were entered to estimate the number of roosting bats. Caves were entered after young were volant and not critically vulnerable to disturbance. Population size was determined by estimating the area covered by roosting bats and multiplying that figure by a cluster density of 1,828 *Myotis*/m^2 (Tuttle 1975). One cave was entered once in the fall and once during the winter to confirm that it was being used as a hibernaculum.

Cave owners were interviewed to discuss intended use of their land and to assess their willingness to protect caves on their property. Various potential protective measures proposed in the Recovery Plan were evaluated based on the relative importance of each cave and on the information derived from these interviews.

Maternity caves were used by female bats and bachelor caves were inhabited by male and non-breeding female bats during the breeding season. Bats roosted in caves termed hibernacula during the winter.

Results and Discussion

Nine gray bat caves were listed for Florida in the Gray Bat Recovery Plan (US Fish and Wildlife Service 1982). However, two of these are used on a transient basis according to the Recovery Team. Because no special management considerations were recommended in the Recovery Plan, I did not include these two caves in the study.

Information available before my study on the remaining seven caves is summarized in Table 1. By the early 1970's, there was only one major gray bat maternity cave, Judges Cave, remaining in Jackson County, Florida, and several smaller maternity and bachelor caves: Miller, Geromes, Girards, Fears, and Sneads. One hibernaculum, Old Indian Cave, is also listed. For all caves, human disturbance is the primary threat identified.

As of March 1983, no additional gray bat caves had been located even though spelunking clubs have been surveying the Marianna cave region in Jackson County intensively for new caves for years. That no additional bat caves have been discovered in at least ten years suggests that the known caves are virtually the only ones inhabited by gray bats in Jackson County, Florida.

Judges Cave—This maternity cave still housed a very large population of bats throughout the breeding seasons of 1981, 1982, and 1983. According to Tuttle (pers. comm.), 50,000-100,000 bats of both species still breed in this cave, and it still harbors more gray bats than any other cave in Florida. Judges Cave contains deep water which discourages trespassers and is thus not heavily disturbed.

The GFC in cooperation with the Florida office of the Nature Conservancy purchased Judges Cave in November 1982. Gray bats from this cave feed beneath the tree canopy enroute to their primary foraging habitat over the Chipola River. Therefore, this purchase included a 14.2 hectare forested corridor from the cave to the river. Because the acquisition did not include river frontage, a conservation easement will be obtained from the owner of the adjacent flood plain. A chain link fence will be erected in a 10 meter radius around the cave entrance and interpretive warning signs will be posted. GFC law enforcement personnel will patrol the property on a regular basis to deter trespassers, and a Commission biologist will oversee its management.

Geromes Cave—On 12 and 23 June 1981, I counted 200 bats emerging from Geromes Cave. Remains of an old campfire just inside the cave entrance and numerous beer bottles and food tins suggested disturbances. The cave floors are usually flooded during the rainy season, which apparently provides protection from predators and human intruders (Tuttle 1977). On 7 July 1981, the cave was completely dry, an unusual situation resulting from the severe drought conditions. Dry conditions and disturbances probably had caused partial abandonment by both species by the time I visited the cave in 1981. The paper company owning this cave has no current plans for logging the surrounding tract because timber inside the hammock is too difficult to reach and remove. Geromes Cave was established as a Critical Wildlife Area during Spring 1982, a designation that empowers the GFC to prohibit entry. Since then, warning signs have been erected and law enforcement personnel have been patrolling the area regularly.

Girards and Fears Cave—I estimated approximately 2,000 bats clustered inside Girards Cave on 7 July 1981. I suspect that virtually all of these bats were southeastern bats in that this species is more tolerant of intrusions than gray bats (M. Tuttle pers. comm.). Signs of frequent disturbance were evident throughout the cave.

No bats were observed inside Fears Cave when surveyed on 7 July, 1981, although I saw no signs of disturbance. This cave is owned by the same person as Girards Cave. No habitat alterations

are planned at either cave.

The owner was unwilling to have Girards and Fears Caves designated as Critical Wildlife Areas or to allow a fence to be constructed around Girards Cave. The GFC thus has no means of preventing entry. Warning signs may be posted, but this action will probably not reduce the numbers of intrusions to a level acceptable for reoccupation by gray bats.

Sneads Cave—A colony well in excess of Tuttle's 1970 estimate of 35,000 (Table 1) inhabited this cave during the 1981 breeding season (M. Tuttle pers. comm.). I could not determine the number of these that were gray bats for reasons discussed earlier. The cave was also occupied in October 1981 and February 1983. Disturbance was rare, partly because the cave is within the well-guarded boundary of a power plant and because the cave is small and of little interest to cavers. The power company has stated that it does not intend to develop the hammock within which the cave is located (G. Layman pers. comm.). However, it declined the Commission's offer to establish the cave as a Critical Wildlife Area. They allowed the GFC to post signs at the cave entrances and to patrol the area throughout the breeding season.

Old Indian Cave—Old Indian Cave was the only known gray bat hibernaculum south of northern Alabama, and it historically housed a summer colony in excess of 20,000 bats (Lee and Tuttle 1970). Because of human disturbance, FDNR gated the entrances in 1970 to prevent unauthorized entry. Unfortunately, they also blocked portions of entrances and installed the gates in such a way that airflow was curtailed. This cave became too warm for successful hibernation and, in addition, gates increased bat vulnerability to predators (Tuttle 1977).

On 29 June 1981, only two *Myotis* sp. emerged from Old Indian Cave and on 7 July two male southeastern bats were seen inside. In early October one gray bat and five *Myotis* sp. were observed roosting. On 2 February 1981 one small cluster of 150 *Myotis* sp. was observed inside the cave.

Because of severe problems with vandalism, FDNR removed only one of the four gates at Old Indian Cave and restored this entrance to its original dimensions in May 1982. The entrance was fenced off and posted with interpretive signs. These actions should restore air circulation and provide bats with freer access to the cave. No entries into the cave will be permitted between February 1982 and winter 1983 in order to allow bats to return to this cave.

Miller Cave—No bats were observed on 7 July 1981 in Miller Cave.

TABLE 1. Status of Gray Bat Caves in Florida prior to 1981.[1]

Cave name	Colony type[2]	Population estimates	Date
Judges	Maternity	10,000 gray and 90,000 southeastern	1971
Geromes	Maternity	2,000 gray and 15,000 southeastern	1970
Girards	Maternity	1,000 *Myotis* sp.	1970
Fears	Bachelor, formerly maternity	500 *Myotis* sp.	1970
Sneads	Bachelor, maternity for southeastern bats	100 gray 35,000 southeastern	1970
Miller	Transient hibernaculum	500 *Myotis* sp.	1970
Old Indian	Hibernaculum	125,000 *Myotis* sp.	
	bachelor	20,000 *Myotis* sp.	1940's
	Hibernaculum bachelor	1,000 gray and 3,000 southeastern	1969
	Hibernaculum	2 gray and 25 southeastern	1975-76
	Bachelor	50 *Myotis* sp.	1975-76

[1]All information was collected or provided by Dr. Merlin D. Tuttle
[2]See Methods for definitions

Entrances to this cave were gated by FDNR to prevent unauthorized entries, but monthly spelunking tours were permitted until cancelled in October 1981. Air flow is not impeded by the design of the gate at this cave (M. Tuttle pers. comm.). Interpretive signs have been posted explaining the reasons for the cave's off-limits status. The cave will be inspected once during winter 1983 to determine if bats are utilizing this cave.

SUMMARY

Acquiring and subsequently protecting the primary maternity cave (Judges), restoring winter and summer colonies in Old Indian Cave, and eliminating disturbance at Geromes Cave are actions essential to the survival of the gray bat in Florida. Protecting less critical caves (Sneads and Miller) is also important. The abandonment of Girards Cave and Fears Cave by gray bats appears to be inevitable given the landowners reluctance to protect them from disturbance.

If all management options planned or now underway are successful, Florida's gray bat population should remain stable or, hopefully, increase. All caves should be continually patrolled and the success or failure of management actions should be monitored. In addition, concerted efforts both to maintain bat foraging habitat and to encourage public support for protecting this endangered species must be made.

Acknowledgements

I would like to thank Merlin D. Tuttle, James Layne, Stephen Humphrey and John Brady for critically reviewing the manuscript. Members of the Florida State Cave Club were especially helpful in locating caves. The project was conducted as part of the Florida Game and Fresh Water Fish Commission's Endangered Wildlife Project. Funds were partially provided by the US Fish and Wildlife Service.

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REVIEW

Status reports on twelve raptors.—D. L. Evans. 1982. U.S. Fish. Wild. Serv., Spec. Sci. Rept.—Wild. 238: 1-68.—Distribution, ecology, management and status. Compiled largely from the literature through mid-1977 with some update through 1979. Nine of the 12 species occur regularly in Florida; Bald Eagle, Burrowing Owl, Caracara, Cooper's Hawk, Marsh Hawk, Merlin, Osprey, Peregrine Falcon, Sharp-shinned Hawk. However, only the Caracara and the Burrowing Owl accounts contain much information about Florida populations.—**Fred E. Lohrer**, Archbold Biological Station, Route 2, Box 180, Lake Placid, Florida 33852.

NOTES

Banded Royal Terns in inland Florida.—The Royal Tern (*Sterna maxima*) is a rare bird in inland Florida (Sprunt 1954). It is considered to be a vagrant in Alachua County (Austin and Hardy 1981), with only two records in 4 November 1950 and 17 January 1951. It is rare in fall and winter in Polk County (Geanangel 1980). Paul J. Fellers (in litt.) noted "only four Polk Co. records over the past 20 years of intensive birding by John Edscorn and myself, and more recently by Chuck Geanangel." Three of these Polk Co. records are of single birds seen at Lake Parker on 22 December 1973 (Agey 1974), 7 December 1974-26 January 1975 (J. B. Edscorn *in* Stevenson 1975), and 25 September 1976 (Edscorn 1977). The fourth record is of a single bird seen at Homeland phosphate slime pit on 26 October 1981 (P. J. Fellers, pers. comm.). Also, one record exists for the well-visited Zellwood muck farms (Orange Co.) of a single bird seen on 7 September 1968 by J. B. Edscorn, C. Edscorn, and H. B. Herbert (P. J. Fellers, pers. comm.). Van Velzen (1968) summarized the recoveries of Royal Terns banded as chicks in Lower Chesapeake Bay, Virginia, during 1964 and 1965. Seventeen of these Royal Terns, all immatures, were recovered in Florida from November through June, with 35 percent of them being recovered in January. All were from coastal localities with 11 records from the Atlantic coast (Volusia Co. to Key Largo, Monroe Co.), four records from the Gulf coast (Sarasota Co.) and two from the Dry Tortugas. I here report the recovery of two banded immature Royal Terns and two additional sight records from Highlands County, ca. 110 km from either coast, in interior south-central Florida.

The first tern (USFWS No. 724-00876) was captured by hand by Clement Latimer on 1 December 1978 1.5 km north of Lake Placid at Lake June-in-Winter. It died soon after capture. It had a short length of monofilament fishing line protruding from its mouth and a fish hook in its throat. The second tern (USFWS No. 644-44881) was found dead on 26 February 1979 6 km NW of Sebring on Lake Sebring by Zenon Hansen. The bird had been seen several days earlier by Hansen as it perched on his dock. The bird had a small hole, 6 mm in diameter and 10 mm deep, at the base of its upper mandible between its eye and nostril. Both birds had been banded as chicks the previous summer; the first on 23 June 1978 at Morgan Island near Cape Lookout, North Carolina, by John H. Buckalew; and the second on 1 July 1978 on the Delmarva peninsula on Metomkin Island, several km E of Accomac, Virginia, by John S. Weske. Death of terns by fishing line appears to be rather common. Of Van Velzen's (1968) 17 recoveries in Florida, 35 percent were listed as "entangled in fishing gear."

The terns were prepared as study skins and are deposited at the University of South Florida, Tampa. Both were females without fat. Weights were 318 g for the December bird (SRP 14) and 292 g for the February one (SRP 16). Measurements of the December and February terns, respectively, were as follows: Culmen-57.5, 62.0 mm; tarsus-33.8, 32.9 mm; wing chord-352, 349 mm. The tarsi and toes of the December bird were uniformly black with tan toe pads. However, the tarsi and toes of the February bird were black with bright yellow blotches. Some toe nails were black; some were white; and some were black and white. The yellow of their bills was similar. Buckley and Buckley (1970) described the wide range of color variation in the unfeathered parts and down

of Royal Tern chicks and speculated that it might play a role in individual recognition by parents of chicks in a creche. Apparently variation in leg and toe color persists well after the birds departure from their nesting area.

Both specimens were examined for molt, especially of the flight feathers. In *Sterna* terns new flight feathers are silvery-grey (Stresemann and Stresemann 1966) with a soft, velvet-like texture that contrasts with adjacent, older and worn feathers. The wing feathers of the December bird were all juvenal, except for a few tertials that were new and unworn. The wings showed little wear except for well-worn greater secondary coverts. Some distal patagial coverts were dark gray, the "shoulder-spot" of some immature terns. The tail feathers were all juvenal and quite worn except that the second pair from the center was new and unworn. The February bird had begun wing molt. On both wings primaries 1 and 2 and secondary 1 were new, full-length, and unworn while the rest of the remiges were worn, especially the distal primaries. Greater secondary coverts 6 and 13-18 were very worn while 1-5 and 7-12 were new and unworn. Based on a sample of six juvenile specimens (three from Florida) Stresemann and Stresemann (1966) predicted that the step-wise primary molt of Royal Terns in their second year "begins usually in February or early March." These two Florida specimens confirm their prediction.

More recently in Highlands Co., Robert Fernau and I saw a Royal Tern on 10 January 1982, 4.5 km S of Lake Placid town along the shore of Lake Placid, and on 29 March 1982 Jack Hailman saw a Royal Tern 3 km SW of Lake Placid on Lake June-in-Winter. These were the only two sightings of Royal Terns from the area during the winter of 1981-1982 despite my almost daily visits to a favorable gull-tern loafing area at Lake Placid, and each sighting occurred after periods of strong winds from the northwest and northeast respectively.

I thank Charles Geanangel, Paul J. Fellers, Robert W. Loftin, John S. Weske, and Glen E. Woolfenden for their helpful comments on an earlier draft of this note. Fellers kindly provided information on unpublished central Florida sightings. William B. Robertson, Jr., and Woolfenden provided access to a translation of Stresemann and Stresemann.

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Kirtland's Warbler sighting in Palm Beach County, Florida.—On 29 April 1982 we observed a Kirtland's Warbler (*Dendroica kirtlandii*) on Hypoluxo Island, Palm Beach County, Florida. Hypoluxo Island, a residential area with vestiges of tropical hammock, lies one-half kilometer inside the barrier island. This bird was found in the front yard of a private residence. In this grassy yard grew a gumbo limbo (*Bursera simaruba*), two mature pigeon plum (*Coccoloba diversifolia*), four cabbage palms (*Sabal palmetto*), and a small mahogany (*Swietenia mahogani*). In the adjacent empty lot to the south mature native trees and shrubs formed dense cover. Using 7 x 35 and 10 x 50 binoculars from a distance of 12 m, we viewed this silent bird in a leafless gumbo limbo continuously from 0745 to 0750. We noted persistent tail wagging and the slow deliberate movements as this large warbler fed among the small branches and tiny flowers in the crown of the 8 m tall tree. No other birds were in the immediate area.

This bird had a warbler bill, blue-gray head, neck and back with black lines down the back. No wing bars were evident on the gray wings. A dark smudge near the eye made the broken white eye-ring distinct. On the ventral side we noticed bright yellow on the throat and breast and soft yellow on the upper abdomen. The lower abdomen and undertail coverts were white. There were two small black flecks near the center of the breast. Short prominent black streaks marked the side of the breast near the shoulder. A narrow strip of white on the sides and flanks below the wings was partially covered by two parallel irregularly formed sooty streaks. Comments on plumages of the Kirtland's Warbler by Van Tyne (1953) indicated to us that the bird was a male in the first year breeding plumage because of its yellow upper abdomen, the two small black flecks near the center of the breast, and facial smudge.

Our sighting is the sixth published spring record for Florida and the southernmost for the United States in that season. The first recorded Kirtland's Warblers in Florida were one seen on 19 April 1897 and another collected on 27 April 1897 by Charles B. Cory (1898) at West Jupiter, Palm Beach County. Sam Grimes collected one in Duval County on 1 May 1932 but discarded it after an aborted attempt to skin it (Mason 1960, in litt. to C. Wesley Biggs). Two inland spring sightings are both from Gainesville, Alachua County, one on 26 April 1934 by R. C. McClanahan (1935) and one on 12 April 1970 by James Horner and Bob Wallace (Wallace 1971).

Several published fall sightings of the Kirtland's Warbler in Florida have been reviewed and rejected by Van Tyne or Clench (Clench 1973), but the following fall sightings have been accepted by them: 9 September 1919, Wakulla County (Griscom and Nichols 1960); 21 September 1958, Dade County (Art Schaffner and Richard Cunningham in Stevenson 1959); and 2, 3 November 1961, Palm Beach County (Veronica Carmen in Stevenson 1962). A 27 October 1978, Martin County (L. Malo in Edscorn 1979) sighting has not been reviewed critically by Clench.

The generally accepted spring migration routes of the Kirtland's Warbler are from the Bahamas to the coasts of Florida, Georgia, South or North Carolina and then northward along the coast before heading across the Appalachians to the breeding grounds (Byelich 1976). Although our suggesting an alternate route with meager data available might seem presumptuous, the two inland sightings at Gainesville suggest that some birds may cross to the east coast of Florida from the Bahamas, a main migration corridor for warblers, and then work northwesterly. These birds may skirt the southern end of the Appalachian

chain on their way to their breeding grounds. This may explain the curious spring record in St. Louis and the strange grouping of several sightings near Chicago, southwest of the known Michigan breeding grounds (Byelich 1976).

C. Wesley Biggs, Mary H. Clench, and Paul W. Sykes, Jr., generously provided background materials, historical records, and thoughtful revisions of the text.

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H. P. Langridge, 1421 W. Ocean Ave., Lantana, Florida 33462 and **Gloria Hunter**, 1716 13th Ave. N., Lake Worth, Florida 33460.

Florida Field Naturalist 12: 9-10, 1984.

A Fork-tailed Flycatcher in Florida.—On 5 May 1981 at Oasis Ranger Station, Big Cypress National Preserve, Collier County, Florida, I observed a Fork-tailed Flycatcher (*Tyrannus savana*). I first saw the bird at 1600 and watched it for approximately 20 min along the edge of a borrow pond. It was viewed as close as 10 m in good light with 7 x 35 binoculars. When observed, the bird was hawking insects from the bare branches of Brazilian pepper bushes (*Schinus terebinthifolius*) that dot the borrow pond edge. When perched, it sat at approximately a sixty degree angle to the ground, motionless except for moving its head to look about. Frequently it sallied forth after insects.

The bird was slightly larger than nearby Eastern Kingbirds (*Tyrannus tyrannus*). Its most distinctive feature was the length of the tail, which was equal to or slightly greater than the length of the body. The bird was generally dark above and light below. The head and upper nape were black with a thin longitudinal light-colored streak on the crown. The back and lower nape were light bluish-gray. The wings were darker brownish-gray, and the tail was almost black. The chin, throat, breast, belly, and under-tail coverts were white. The bill was stout and black. The eyes were dark, and the feet were relatively small and black.

There are five previously recorded observations of the Fork-tailed Flycatcher in Florida. A sighting on 5 Nov. 1952, 24 km west of Okeechobee along S. R. 78 in Glades County, was reported by Sprunt (1954, Florida bird life, New York, Coward McCann Inc.) Monroe and Marron (1980 Amer. Birds 34: 842-845) summarized three other sightings: one bird on 15-16 July 1974 at Sugarloaf Key, Monroe County; an immature bird on 17 Sept. 1976 at Rockledge, Brevard County; one bird on 17 October 1976 at Chokoloskee, Collier County. Edscorn (1977, Fla. Nat. 50: 30) reported one bird in mid April 1977 on Sannibel Island, Lee County.

Spring records of the Fort-tailed Flycatcher anywhere in North America are rare. Including the above sightings and others summarized by Monroe and Barron (1980), of 43 records only five were in March-June, including the April, 1977 sighting on Sannibel Island, Florida.—**Michael W. Britten,** 9705 Waterfront Dr., Manassas, Virginia 22110.

Florida Field Naturalist 12: 10-11, 1984.

The Northern Saw-whet Owl in northeast Florida.—On 10 November 1982 an unidentified surfer found a live Northern Saw-whet Owl (*Aegolius acadicus*) in the surf at South Ponte Vedra Beach, St. John's County, Florida. The bird was taken to the St. Augustine Wildlife Rehabilitation Center where it was treated for exposure and exhaustion, but it died on 14 November. Lisa Miller took the specimen to the Florida State Museum in Gainesville, where Dr. J. W. Hardy prepared it as a study skin (UF 20899). The bird was a male (testes 2x3 mm) and showed no signs of disease, but two small holes were found in the skin of the neck. The specimen was an adult, of the subspecies *A.a.acadicus*.

The owl was found in the same area of the state where a Northern Saw-whet Owl was collected on 31 October 1965 by F. H. Lesser and A. R. Stickley, Jr. (1967, Auk 84:425). The A.O.U. Checklist (1957, fifth ed., Baltimore, Maryland, American Ornithologists' Union) mentioned a winter record for Ft. Myers, Florida, but it is unsubstantiated and probably erroneous (H. M. Stevenson pers. comm.). Thus, the bird we report is the second specimen for the state, both from St. John's County.

That the owl was found in the surf is surprising. L. J. Soucy cited two instances of Northern Saw-whet Owls landing on fishing boats off the coast of New Jersey (1982, New Jersey Audubon 8:20). It would be rash to conclude that this owl migrates over the water with any regularity. It seems far more likely that occasionally individuals are blown offshore or become disoriented and wander out over the ocean.

In addition to these specimen records, there are two records of Saw-whet owl calls heard in northeast Florida. On the St. Augustine Christmas Count, 18 December 1982, Joseph Wilson deliberately sought this species by playing a tape of its call at many places near St. Augustine before dawn. Wilson heard a reply which, based on his experience with the species in the Great Smoky Mountains, he believed was a Saw-whet. This call was also heard by Robert Richter, who was with Wilson.

On the Jacksonville Christmas Count, 30 December 1972, Peggy Powell and Terry Reed were near Buckhead Bluff, off Island Drive, Duval County, Florida, where they heard a call at dusk which Powell believed was a Northern Saw-

whet Owl because of its similarity to recorded calls. The record was published (1973, Amer. Birds 27:145, 302) but with skeptical comments by the editor, Allan D. Cruickshank. Therefore, discussion of hitherto unpublished details of this record are appropriate. On two different nights thereafter, Fred Wetzel, formerly assistant curator at Hawk Mountain Sanctuary, Pennsylvania, was able to get the owl to answer his whistled imitation of its call. He had no doubt that this bird was a Northern Saw-whet Owl. On one of these occasions, Wetzel and other observers saw a small owl fly toward them from the direction of the call, but they were unable to see it well enough to say with certainty that it was a Saw-whet Owl.

These sound records, together with the two specimen records, all from the same area of Florida, raise the possibility that this tiny, secretive owl may be more common in winter in northeast Florida than previously thought. Because of its nocturnal habits and preference for thick cover, it is easy to overlook. Further research is needed to accurately understand its status in Florida.—**Lisa Marie Miller**, P.O. Box 16196, Jacksonville, Florida 32245 and **Robert W. Loftin**, University of North Florida, 4567 St. John's Bluff Rd. S., Jacksonville, Florida, 32216.

Florida Field Naturalist 12: 11-12, 1984.

Tree Swallow flock preys on swarming termites.—Tree swallows (*Iridoprocne bicolor*) wintering in the southern USA commonly form large flocks (Howell 1932, Bent 1942, Longstreet 1969, Terres 1980, Kilham 1980). The function of such flocking may be variable. In this note I show that one function is feeding on swarming insects.

At 1240 on 18 February 1983, four colleagues and I saw several hundred tree swallows massing over the railroad tracks and the pine woods adjoining the main building at the Archbold Biological Station, Highlands County, Florida. The skies were partly cloudy, air temperature 21.1°C, relative humidity 25%, barometric pressure 763.0 mm Hg, wind speed 107-215 m/min gusting to 270 m/min, wind direction NNW ranging from W to NNE. The birds flew quickly back and forth or in circles, veering from side to side. Individuals sometimes made short, low-pitched sounds as if they were clapping their wing tips. Occasionally the flock formed a vortex that rose from a few meters above the ground to more than 50 m, as judged from the height of the Station's water tower (42.7 m).

The flock of tree swallows centered over a rotten slash pine (*Pinus elliottii*) stump from which alate termites were dispersing into the air. Andrew Schreffler and I observed several birds swoop down and catch termites before the insects had risen more than 3 m above the stump. For the next 2 hr the swallow flock moved periodically from east to west and back again downwind from the source of termites, suggesting that it was tracking a plume of the weakly-flying insects carried away from the stump. This pattern was reminiscent of that described by David et al. (1982) for insects cuing on odors dispersing from a point source. The termites were identified by Mark Deyrup as *Reticulitermes flavipes* (Kollar), a common eastern subterranean species that swarms in the spring with the onset of seasonally warm temperatures (Snyder 1948). These flights are solely for dispersal of virginal adults, usually for short distances from the parental colony; mating is delayed until a pair of termites establishes itself in a retreat within wood or in soil (Nutting 1969).

Migrant tree swallows may commonly aggregate to prey upon swarming insects. Several years ago in late winter Fred Lohrer (pers. comm.) saw an aggregation of tree swallows feed on winged termites or ants as they emerged from the ground in Highlands County, Florida. Flocks of tree swallows perform similarly when ants, moths, and other small insects swarm over wetlands, hammocks, and cultivated fields in the state (Howell 1932, Bent 1942). This behavior may be extensive within the Hirundinidae, for migrants of this and other swallow species also assemble in large aggregations in the fall to feed aerially on large swarms of midges in Illinois (Graber et al. 1972). Aerial predation of this sort might be difficult to detect from a distance, even with binoculars. Swarming also occurs in the absence of insect foraging (Robertson pers. comm.) and perhaps without any relationship to immediate foraging (Kilham 1980). It therefore may have several functions.

I thank the Archbold Biological Station and its staff for support.

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Florida Field Naturalist 12: 12-13, 1984.

Vigorous digging by a Brown Thrasher after disturbance at the nest and comments on the species' behavior.—On 23 April 1981, I observed a Brown Thrasher (*Toxostoma rufum*) perform a behavior to my knowledge not reported previously in the literature. The bird was an especially pugnacious thrasher nesting in an abandoned citrus grove, 4.8 km S of Oviedo, Seminole County, Florida. When I approached its nest located in a small oak, the incubating bird flew immediately from the nest onto the ground in a sandy area

nearly devoid of vegetation. The sandy area was about 4 m from the nest tree. The thrasher began immediately plunging its bill up and down into the sand with forceful and rapid movements of the head. After digging into the same spot six times, the bird moved a few centimeters to another area and repeated the process. The digging behavior was repeated in about eight different locations within an area of about 1 m^2. Some of the holes dug were over 2 cm deep. During the entire digging process, the thrasher gave a constant low pitched, sass call, which is apparently the hissing sound mentioned by Bent (1948, U.S. Natl. Mus. Bull. 195). After about 1 min of digging, the bird then flew to a low branch of a nearby tree. It gave the familiar "tick" call and wiped its bill several times on the branch, apparently removing adhering sand. The bird then flew back to the nest tree, producing both the sass and tick calls but returned quickly to the original area on the ground where again the digging process was repeated for about 1 min before flying away. The thrasher never pulled grass or similar material with its bill which has been reported for grackles, jays and ravens during displacement activities (Welty, J. 1975, The life of birds, 2nd ed., W. B. Saunders Co.).

All species of *Toxostoma* do much of their foraging on the ground and use their bills during the process. However, bill use differs among the North American species of thrashers. Engels (1940, Univ. of California Museum of Vertebrate Zoology 42: 341-400), in his comparative study of structural adaptations in thrashers, concluded that one of the common feeding behaviors of the Curve-billed (*T. curvirostre*), California (*T. redivivum*), Crissal (*T. dorsale*), and Le Conte's (*T. lecontei*) thrashers is that they dig with their bills much like using a pick, which is unlike the typical feeding behaviors of the Brown Thrasher and Bendire's Thrasher (*T. bendirei*). Usually the Brown Thrasher during foraging will thrust its bill in debris and loose soil and toss the material with lateral sweeps of the bill (Clark 1971, Wilson Bull. 83: 66-73). Also, an individual will thrust its bill straight into the ground with repeated sharp blows or hammers a seed into the ground in an attempt to crack the seed, a behavior that also occurs in Blue Jays (*Cyanocitta cristata*) and the Tufted Titmouse (*Parus bicolor*). However, the Brown Thrasher does not normally use powerful, deliberate digging strokes that result in holes two or more centimeters in depth.

A possible interpretation of this unusual behavior might be that of a hungry bird being efficient by vigorously searching for food at a time when a direct return to the nest was perceptively dangerous. However, I have no evidence that the thrasher was digging for food items; the bird never opened and closed its bill to suggest that food was being sought or consumed. It was quite clear to me during this and subsequent observations that this thrasher's behavior was especially belligerent and that the digging behavior was in response to my disturbing the bird from the nest.

The digging behavior prompts the following observations on thrasher behavior because little information is available describing differences in the behavior between individuals of the same species and between different species of the same family. Having observed several hundred thrashers at their nests located throughout the species' range, it is apparent to me that some individuals are more bold and pugnacious than others. Some individuals are reluctant to leave their nests when approached, whereas others slip away quietly from their nests with the least disturbance. Although I do not have data that indicate the percentage of thrashers observed that display belligerency and

pugnacity toward intruders at their nests, I suspect that the percentage is high. On several occasions I have had individuals with eggs or young in their nests dart quickly and directly at me and strike my hand, arm, and head with their bills. It is not uncommon for the bill strikes to draw blood. Bent (1948) cited similar instances where individual Brown Thrashers have struck observers at their nests. Compared to my observations on the Northern Mockingbird (*Minus polyglottos*), the Brown Thrasher certainly demonstrates more pugnacity and boldness in defending its young and nest site. The mockingbird usually sounds its tick call or performs repeated dive bombs at a human, cat, or dog; however, I have never had an individual dart quickly from the nest and come directly at me striking with its bill with such force as to produce blood. Again in certain individual Brown Thrashers at least, their distress vocalizations produced when an intruder is at the nest are more intense than those of the Northern Mockingbird.

I thank George Clark and the anonymous reviewers for their helpful suggestions. Those of Clark were especially useful. This study was supported by Rich Plan of Florida to which I am deeply grateful for their financial aid.—
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Florida Field Naturalist 12: 13-15, 1984.

Marine birds injured by welding rods.—The Marineland Research Laboratory of Marineland, Inc., St. Johns County, Florida, has been operating an avian rehabilitation project since July 1976. While the vast majority of birds rescued had ailments typical of a coastal environment, on two occasions marine birds were found that had been injured by welding rods.

In the first case, Mrs. Sandy Gleeson reported a large bird on the beach 400 m north of the Marineland complex on the morning of 26 March 1981. Upon investigation, a live, adult Northern Gannet (*Sula bassanus*) was found in a weakened and listless condition. The bird was taken to the facility for recovery where a gross physical examination revealed no cause for the bird's condition. The only abnormality noted was a stiff lower neck, but no injury was found by palpatating the neck. The gannet was placed on supportive therapy of intubations of liquids and forced feedings of fish. Observations throughout the day suggested that the bird may have been improving by the end of the day. It was rather surprising that the gannet was found dead the next morning.

A general necropsy showed both the external and internal aspects of the bird to be grossly normal. However, a large foreign body was found lodged between the beginning of the esophagus and the apex of the stomach. Later identified as a stainless-steel welding rod, it measured 44.8 cm long and just under 1 cm in greatest diameter (Fig. 1). I believe it was responsible for the gannet's condition. The cranial end of the rod had become wrapped in a large fold of esophageal tissue and was lying along the neck vertebrae where it could not be felt externally. The rod had induced erosion in the mucosae, which had nearly punctured the esophagus. The mucosae in the stomach showed no gross pathological lesions, but the rod had distended the apex of the stomach to the point where it partially occluded the vent. While a large amount of fecal material was present in the cloacal bursa, the presence of the rod did not greatly impare functioning of the gastro-intestinal system in that

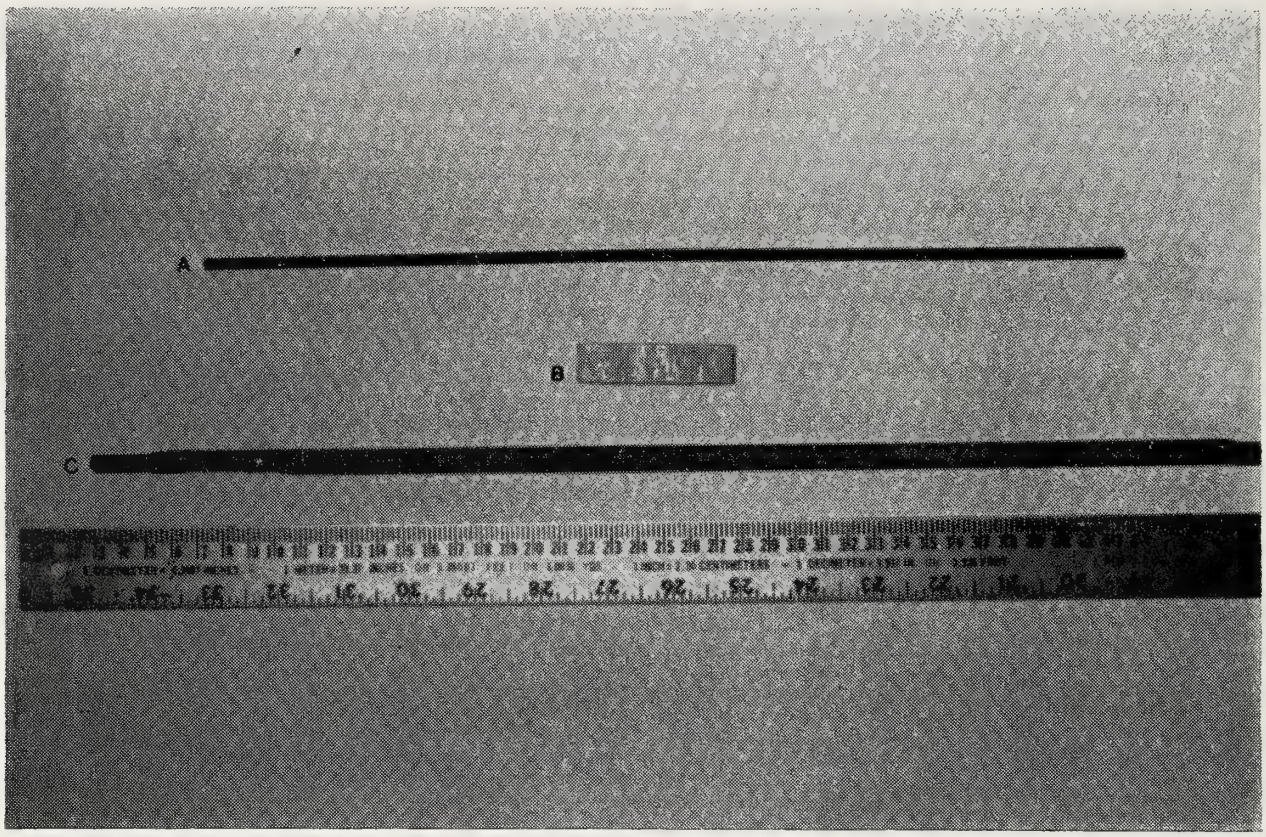

Fig. 1. A. 35.3 cm wire rod recovered from the breast of a Brown Pelican. B. Left leg band from a Northern Gannet. C. 44.8 cm stainless-steel welding rod found in the gastro-intestinal tract of a Northern Gannet.

the food that had been force-fed the day before was fully digested. A similar case in England has been reported by Snook (1977, Brit. Birds 70:35) in which a weak Northern Gannet was found in a field after having swallowed a 44 cm long, 2 mm diameter brass welding rod, which later caused the bird's death.

The gannet had been banded while too young to fly on 9 September 1967 near Barachois, Quebec, Canada, by J. Poulin (band number 588-73422). Worn for some 14.5 years, the band (Fig. 1) was still legible and carried several spots of what appeared to be yellow paint.

In a second case, an immature, unbanded Brown Pelican (*Pelecanus occidentalis*) was brought to the Marineland facility on the evening of 22 January 1982. A wire rod, 35.3 cm long and 3 mm in diameter, was found to have punctured the bird's right breast 10 cm. Although the wound was primarily subcutaneous, the rod did extend into the breast musculature about 4 cm but was easily removed by Mr. David Nelson of Marineland. The pelican was then placed on appropriate support therapy, ate quite well, and following recovery, was released unbanded to the wild on 6 February 1982. The rod was the core from a 3/16 inch stainless-steel welding rod (Fig. 1).

I thank the Bird Banding Laboratory at the Patuxtent Wildlife Research Center in Laurel, Maryland for providing banding data on the gannet and Dr. Michael Stoskopf for his assistance in locating the reference to the case in England.—**Robert L. Jenkins**, Marineland Research Laboratory, Rt. 1, Box 122, St. Augustine, Florida 32084 (Present address: National Aquarium in Baltimore, Pier 3, 501 East Pratt Street, Baltimore, Maryland 21202.)

Sight record of Band-rumped Storm-Petrel off the coast of Palm Beach County, Florida.—On 25 July 1982, at 0710 approximately 24 km ENE of Boynton Inlet, Palm Beach County, Howie Langridge (son of second author), John McMellon, and the authors observed a bird which we identified as a Band-rumped Storm-Petrel (*Oceanodroma castro*). In a 19-ft boat powered with a 100 hp outboard engine, we pursued the bird on a flat sea at a speed of 48-56 kph as it tried to elude us. The sky was clear at the time. On our initial approach we were able to get within 5 m of the bird and saw it from the side and rear. We watched the storm-petrel at distances of 8 to 15 m for most of our 10-min observation period. It stayed within a meter of the ocean surface at all times. At 0745 about 5 km further east, we found and chased what appeared to be the same bird for 2-3 min. Langridge and Sykes wrote notes during and immediately after the observations while Trotsky operated the boat.

We were able to compare the bird we saw to the Wilson's Storm-Petrel (*Oceanites oceanicus*), three of which were seen on the same trip, one within 5 min of the initial observation described above. The bird we saw was noticably larger than *oceanicus*.

The general coloration of the body of the bird we saw was very dark brown, not black. This was readily apparent in the good light at close range. The wings were narrow, appearing longer than in *oceanicus*, which are paddle shaped. The wings were dark brown with a light bar on the upper surface and uniformly dark on the under surface. The tarsus, toes, and webbing between the toes appeared black, and the feet did not extend beyond the tip of the tail. The black tail appeared square-tipped. The small immaculately white rump patch was straight along its anterior and posterior edges forming a narrow rectangle. The white of the rump extended across the flank becoming narrow and curving posteriorly onto the under tail coverts to form a blunt hook. Upon first approach the white rump patch was difficult to see because of its narrow width (anterior to posterior) and our angle of view from behind the bird. The rump did not show any dark central division typical of most Leach's Storm-Petrels (*Oceanodroma leucorhoa*). Also, the rump patch of the bird we saw was much more narrow than in *leucorhoa*. The wings of the bird were narrow and appeared longer than in *oceanicus*, and similar to *leucorhoa* except the wings did not have the bend at the wrist as pronounced as an *leucorhoa*. The wing beat was slower than in *oceanicus*. In viewing the bird from the rear, we observed that the wing strokes were above the plane of the body. The flight consisted of a slight zig-zag. It did not bound like *leucorhoa* but flew on an even horizontal course. We saw the storm-petrel make one long glide during the course of our pursuit. While being chased *castro* appeared to have an erratic flight similar to the Common Nighthawk (*Chordeiles minor*) but on a rather direct path except when it changed direction. Our pursuit of the bird probably caused it to alter slightly its usual manner of flight. Our observations described above, made under ideal viewing conditions, fit rather well the principal characteristics given by Watson (1966) and Naveen (1982) for the identification of *O. castro*.

Our observation appears to be the seventh record of the warm-ocean Band-rumped Storm-Petrel for Florida: three in the Gulf of Mexico; two in the Florida Keys; and two in the Atlantic Ocean. Previous records for the state include the following: 1) a bird was found alive at Key West, Monroe County, on 21 October 1958, fed table scraps, but died on 30 October, and was

given to Frances Hames (identification confirmed by Alexander Wetmore) (Stevenson 1959); 2) a bird flew aboard a commercial fishing vessel 56 km off Cape San Blas, Gulf County, on 6 December 1958, where it died (Hallman 1966); 3) Joyce T. Baxter found one dead at Pensacola Beach, Escambia County, on 20 August 1969 (Purrington 1970); 4) Richard T. Paul and Alexander Sprunt, IV, found a bird alive in good condition in a parking lot under a street lamp on Upper Matecumbe Key, Monroe County, on 1 June 1973, and measured, photographed, and released it (Kale 1973); 5) Robert D. Barber and Johnnie Johnson observed an individual off Cape Canaveral, Brevard County, on 15 September 1974 (Edscorn 1975); and 6) C. Peretz and D. King found a sick bird at St. Petersburg Beach, Pinellas County, on 10 October 1977 and after it died deposited it in the collection at the University of South Florida (Edscorn 1978).

In the Atlantic Ocean this species breeds in the Azores, Madeira, Salvages, Cape Verde, Acension, and St. Helena islands and ranges during the nonbreeding season mainly along the west coast of Africa, with vagrants occasionally reaching the eastern and southern United States and southern Canada (Watson 1966, American Birding Association Checklist Committee 1982). Further observations of pelagic birds along both coasts of Florida may reveal the Band-rumped Storm-Petrel to be more regular than the records now indicate.

We wish to thank C. Wesley Biggs for furnishing several of the references.

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The fate of translocated Sandhill Cranes after 10 years.—Nesbitt and Williams (1973, Proc. Ann. Conf. Southeastern Assoc. Game and Fish Comm. 27: 332-335) reported on the dispersal of translocated Florida sandhill cranes (*Grus canadensis pratensis*) wild-trapped in Manatee County from September 1971 to April 1973 and released at Fisheating Creek, Glades County and Paynes Prairie, Alachua County, 96 and 243 km away, respectively. The major purpose of the study was to evaluate dispersal and homing tendencies of translocated cranes and the feasibility of restocking suitable but unoccupied habitats. Each group of translocated birds was distinctly color-banded. Recaptured cranes were later individually color-banded. Sightings of the birds marked as a group have not been summarized since 1973 (Nesbitt and Williams 1973). The status of translocated cranes was not monitored at Fisheating Creek after 1973, but crane studies on Paynes Prairie resulted in subsequent sightings and retrapping of several translocated birds. Here we report on the status of 4 of the 15 birds released on Paynes Prairie.

At least two of the 15 cranes have died. In July 1981, one bird translocated from Manatee County on 5 April 1972, and retrapped on Paynes Prairie on 3 May 1972, was found dead on a ranch east of Dunnellon, Marion County, Florida, a straight-line distance of 68 km southwest of Gainesville. Though we cannot be sure, this bird or another of the translocated cranes was probably still subadult when it moved from the prairie to this ranch as a color-banded translocated crane was seen there in 1975 (N. Holler and N. Eicholz pers. comm.). All translocated birds were at least one year old when captured (Nesbitt and Williams 1973); this crane therefore lived for a minimum of 10 years. The second bird, also caught in Manatee County and relocated on 5 April 1972, died during trapping on Paynes Prairie 15 May 1973.

Two of the original 15 birds, recaptured and individually color-marked on Paynes Prairie, have been seen repeatedly. Our sightings and retrapping locations were always on or near Paynes Prairie. One crane (band number 598-64272) was seen or retrapped on three occasions (30 January 1981, 6 February 1981, and 19 June 1981). On the last date the bird was at least 10 years old.

The other crane, a male, (band number 558-40902) was aggressively defending a territory when first seen on 3 March 1979. It successfully raised a chick during the 1981 nesting season. During the spring of 1982, excessive rainfall interrupted nesting of cranes on Paynes Prairie, but this bird was paired and on its territory during 1982. On 7 July 1982, it was trapped and outfitted with a radio transmitter. During 1983, this bird attempted unsuccessfully to nest twice. Both times the nest was abandoned after heavy rains. This bird, originally trapped in Manatee County on 13 April 1972, was then at least 12 years old.

The sedentary nature of adult Florida sandhill cranes (Florida Game and Fresh Water Fish Comm. unpubl. data) is reflected by the site tenacity of the two adults discussed above. The sedentary behavior of the Dunnellon bird after 1975, when it had probably reached adulthood, further substantiates this observation. Subadult cranes are much more itinerant than adult birds (Nesbitt, Wenner, and Hintermister, IV, in prep.); they do not defend territories and may wander a great deal before settling into a breeding area. We can make no assumptions concerning the fate of the 11 birds unaccounted for although they may be surviving somewhere other than Paynes Prairie.

Three of the translocated cranes are known to have survived to adulthood, and one was successfully incorporated into the local Florida sandhill crane population as a breeding member. These survival statistics are close to what has been observed in the natural populations on the prairie (GFC unpubl. data).

Some dispersal off the prairie occurred, similar to dispersal observed among resident subadults. Subadult cranes form loose "nonbreeder flocks." These flocks or units from these flocks may move from their natal areas. We have regularly noticed movement of from 10 to 30 km, so the occurrence of the translocated crane in Dunnellon does not fall far outside the norm.

Translocation of nonmigratory sandhill cranes into occupied habitats seems to have potential as a management technique to augment reduced local populations. Translocation into suitable unoccupied habitats may also be possible. In light of the nomadic tendencies of subadult cranes, it would be advisable to translocate older subadult or adult birds into unoccupied habitat. More research is needed before restocking unoccupied habitats can be unequivocally recommended, but the technique holds promise as a method for reestablishing reduced populations of nonmigratory sandhill cranes and perhaps other nonmigratory species of cranes as well.—**Anne Shapiro Wenner** and **Stephen A. Nesbitt**, Wildlife Research Laboratory, Florida Game and Fresh Water Fish Commission, 4005 South Main Street, Gainesville, Florida 32601.

Florida Field Naturalist 12: 19-20, 1984.

Night migration of Sandhill Cranes.—Reporting on migration of radio-instrumented Greater Sandhill Crane (*Grus candensis tabida*), Toepler and Crete (1979, Proc. 1978 crane workshop, Pp. 159-173, Ft. Collins, Colorado, Colorado State Univ.) implied migrating cranes did not fly after dark. Following a day of particularly heavy crane movement, we observed or received reports of at least 3 flocks of cranes passing over Alachua County in north-central Florida during the night of 24-25 November.

At 2230, a flock of cranes was heard passing over Hintermister's house, 25 k northeast of Gainesville. Later at 0300, 25 November, two separate flocks were heard overhead 30 k south of Gainesville. That night the moon was six days from full and the sky was clear, providing a bright night sky. This situation and the nearness of their ultimate destination, or both, may have encouraged the birds to continue migrating after dark. Whatever the reason, it seems that under some conditions cranes do migrate at night.—**Stephen A. Nesbitt**, Florida Game and Fresh Water Fish Commission and **John H. Hintermister, V**, Route 3, Box 38H, Gainesville, Florida 32606.

Florida Field Naturalist 12: 20, 1984.

REVIEWS

Gulls: a guide to identification.—P. J. Grant. 1982. Vermillion, South Dakota, Buteo Books, 280 pp., including 128 pp. of photos. $32.50.—Presumably Grant's intent was to enlighten European observers; however, this book certainly can be a valuable aid to North American observers. Of the twenty-three gull species discussed by the author, sixteen either breed or have occurred (most of those, regularly) in eastern North America.

Essentially, the book consists of Grant's five-part series on gull identification originally published in British Birds (1978-1981). The first half, approximately, of the book's 280 pages is text. The remainder consists of 376 photographs, most of excellent quality, which depict almost all of the described plumages of the 23 species.

In the "General Information" section, the author discussed the basic aspects of plumage, the understanding of which is essential for expertise in the field. Included are detailed illustrations of a gull's topography consistent with the terms used throughout the book. Beginning gull-watchers should note that the numbering system for the flight feathers is a reversal of that used by most American ornithologists.

The species discussed have been placed into five groups based primarily on similar features, especially in immature plumage, which can and often do cause misidentification in the field. Grant begins each grouping with a brief discussion of similar characteristics plus an illustration, for direct comparison, of the various gulls in their first-basic plumages. This is followed by a very thorough discussion of each species, illustrations of its various plumages and a world distribution map.

Obviously, this book is a result of years of field work and research. Overall, Grant has done an outstanding job of compiling and analyzing data. When he originally published the series in British Birds, he asked readers for suggestions and corrections. In thinking of a future revision, he reiterates this request in the book, and I do have a few suggestions and corrections. In the original series and again in the book, Grant placed the Mediterranean Gull between the Common and Ring-billed gulls. If grouping order is based on similar characteristics, it seems to me that the Mediterranean Gull should immediately follow the Ring-billed Gull and precede Franklin's and Laughing gulls. Also, in the original series when discussing plumage differences of Common and Ring-billed gulls, Grant failed to point out the diagnostic wear pattern of the wing coverts of birds in juvenal and first-basic plumage. He included this important distinctive feature in the book but failed to give credit to Lauro and Spencer (1980, Amer. Birds 34: 111-117) who first published this fact after Grant had published his original discussion of the two species.

I was surprised that Grant failed to describe the unique wear pattern of the scapulars of the Lesser Black-backed Gull in first-basic plumage. The book's lack of photographs of this plumage suggests that it is not encountered in England, i.e., hatching-year *fuscus* leave England while still in unworn first-basic plumage. Yet Grant's failure to describe this wear pattern still seems a significant omission, especially with respect to the many American observers who are faced with distinguishing this species in this plumage from others of the large-gull complex.

I was especially disappointed to find that all photographs were placed together in the back of the book rather than with the appropriate text for quick reference, as they were in the original series. I presume the change was due to cost, but I certainly hope the original format will be followed in any future revision. Unfortunately, no photographs of leucistic or albinistic gulls were included, which Grant had originally indicated would be. Also, in discussing the "white-winged" gulls, Grant is incorrect in stating that "Immature leucistic or albinistic gulls *invariably* have normal bill coloration . . ." [emphasis mine]. I certainly have photographic evidence to the contrary and, in my opinion, particularly when discussing gulls, the term "invariably" should be used with great caution or, perhaps, not at all.

The only real drawback to this book is the price, but I highly recommend it for those who can afford it. However, for those on a limited budget, I suggest going to a university library that has British Birds and consulting the original series. Although the book supposedly has "extensive textual improvements" and "most of the drawings have been revised," I found very little change from the original series significant to correct identification. In fact, the printing quality of the original illustrations is superior to the book's. Also, although 170 additional photographs are included in the book, the photographs in the original series show all the plumage characteristics of the various species that are useful in identification.—**Lyn Atherton**, P.O. Box 58124, Tierra Verde, Florida 83715.

Florida Field Naturalist 12: 21-22, 1984.

The molt of Scrub Jays and Blue Jays in Florida.—G. Thomas Bancroft and Glen E. Woolfenden. 1982. Washington, D.C., The American Ornithologists' Union, Ornithological Monographs No. 29. vii + 51 pp. $8.00.—Intensive investigations of a Florida Scrub Jay population have been the chief focus of Woolfenden's collaborative research efforts since 1969, with Blue Jays coming under close scrutiny beginning about 1976. These combined efforts have resulted in a number of important publications and a wealth of data on population dynamics of individually-marked birds.

Herein, the authors analyze their molt and breeding data, chiefly with the rationale that so little information is available for any species whose details of molt and breeding are based upon birds of known sex and age. More than one half of this monograph deals with detailed molt data for the two species, all essential to a subsequent discussion of time and duration of molting and the breeding season. Not surprisingly, they found that "the pattern of molt by Scrub Jays and Blue Jays in Florida is similar to that exhibited by other passerines," although remigial molt for both species is relatively long (90-120 days). Also, their data indicate that the two species of jays in Florida are similar to most temperate-zone passerines in that breeding is followed by molt with little overlap. For example, "individual Scrub Jays finish nesting from late April to mid-June" whereas "both species molt between early June and November with peak intensity occurring between mid-July and late September."

But, to this reviewer the most stimulating part of the monograph is the discussion relating molt to breeding from an energetic perspective. It has been generally accepted that molt and breeding are each so energetically stressful that (most) birds have evolved separate schedules for the two activities in their annual cycles. The authors examined this dogma in light of the jays breeding in a hot Florida environment and, using somewhat crude estimates, determined energy budgets for the jays. Their subsequent explanation for the separation of molt and breeding more specifically focuses on a combination of thermoregulation, water balance, and, perhaps, flying efficiency.

Those interested in details of annual molt, breeding cycles, and energetic costs related thereto will find this monograph to be complete, provocative, and challenging.—**David W. Johnston,** Biology Department, George Mason University, Fairfax, Virginia 22030.

Florida Field Naturalist 12: 22-23, 1984.

Songs of the vireos and their allies (Family Vireonidae: vireos, peppershrikes, shrike-vireos, and greenlets).—Jon C. Barlow. 1981. Album of 2 33 1/3 rpm phonograph records. $12.00 postpaid. (Available from Ara records, 1615 NW 14 Ave., Gainesville, FL 32605.)—The monographic presentation of bird songs is a godsend to the serious amateur and professional ornithologist wishing to learn or compare the songs of a particular group of birds. The comparison of multiple dialects and song variation can be an invaluable analytic tool in avian systematics and ecology. "Songs of the vireos and their allies" is an excellent example of the monographic approach in nature recording. This double album contains the primary songs of 39 of 43 known species in the expanded family Vireonidae. The four missing species are members of the little known neotropical genus *Hylophilus* (*semicinereus, sclateri, brunneiceps, semibrunneus*). Notable is the inclusion of certain enigmatic Mexican species (e.g., Slaty Vireo [*Vireo brevipennis*], Dwarf Vireo [*Vireo nelsoni*]) and multiple selections of widespread species (six cuts each for Solitary Vireo [*Vireo solitarius*] and Red-eyed Vireo [*Vireo olivaceus*] complexes). The album jacket notes are unusually informative and reflect the phylogenetic relationships suggested by Barlow. Most recordings are clear and free from insect noise and wind turbulence.

In inflationary times when commercial albums retail for $8.00, the double album "Songs of vireos . . ." is a bargain at $12.00. I highly recommend this album for all nature sound libraries and the personal collections of serious birders and ornithologists.—**Gary R. Graves,** Department of Biological Sciences, Florida State University, Tallahassee, Florida 32306.

Florida Field Naturalist 12: 23, 1984.

Distribution and habitat of the Red-cockaded Woodpecker in Big Cypress National Preserve.—Gary A. Patterson and William B. Robertson, Jr. 1981. South Florida Research Center Report. 137 pp. (Available free of charge from Everglades National Park, South Florida Research Center, P.O. Box 279, Homestead, FL 33030.)—The Red-cockaded Woodpecker (*Picoides borealis*) is an endangered species endemic to mature pine forests of the southeastern United States. Its previously known range extended to Long Pine Key in the Everglades, but the species has not been known from that area for decades, and the few known populations in southern Florida (e.g., Corkscrew Swamp) have disappeared in recent years. It was with considerable excitement that I learned

of the existence of a sizeable population of Red-cockaded Woodpeckers in the Big Cypress National Preserve. This 230,000 ha wilderness area in Collier, Dade, and Monroe counties was established in 1974 and is under the stewardship of the U.S. National Park Service. Most of the habitat of Big Cypress National Preserve is aquatic, with only 18% of it being pine forest. That pine forest we are told includes at least 18 and possibly as many as 40 active Red-cockaded Woodpecker colonies.

This report includes a very thorough history of the distribution of Red-cockaded Woodpeckers in this part of southern Florida and is skillfully put into the perspective of natural and man-wrought changes in the area. The authors also provide an excellent review of our knowledge of the behavioral ecology of the species. Most of the report, however, consists of careful description of the colonies found. The narrative is well supplemented by photographs and maps of the sites and tables of cavity tree characteristics. This is an excellent study that includes thorough documentation such that we now have a solid base for monitoring the status of this population and for making meaningful comparisons with populations elsewhere in the species' range.—**Jerome A. Jackson,** Department of Biological Sciences, Mississippi State University, Mississippi State, Mississippi 39762.

Florida Field Naturalist 12: 23-24, 1984.

REPORT

Summary of the 1983 fall meeting.—The fall meeting of the FOS was held 14-16 October 1983 at the Sea Turtle Inn, Atlantic Beach, Florida. The effort of Robert Loftin and members of his committee from the Duval Audubon Society provided an informative and comfortable meeting.

The Board of Directors met and accepted the 1982 Financial Report, the recommendations of the finance committee to add $1,000 to the principal of both the research fund and the special publication fund, and the authorization of page charges and advertisements for the *FFN*. Selection of new members of committees for nomination of officers, the archives, and membership was approved.

The first part of the technical session included papers on "Mortality of the Common Loon on its migration and wintering ranges" by Malcolm M. Simons, Jr. and "The Florida Natural Areas Inventory" by Todd Engstrom. A symposium on the Southeastern Kestrel *Falco sparverius paulus* followed with papers presented by researchers from the University of Florida, Gainesville: "Historical status of *paulus* in Florida" by Mark L. Hoffman; "Relative abundance and different habitat use of kestrels in north Florida" by Petra G. Bohall; and the "Foraging ecology of *paulus*" by Michael W. Collopy.

At the banquet President Kittleson announced Robert Loftin won the skin quiz assembled by Ted Allen of Jacksonville University and introduced Dr. Colin Pennycuick, Maytag Professor of Ornithology at the University of Miami, who spoke to us about "Soaring flight over land and sea" and showed slides from his world-wide research on birds.

The next annual meeting will be in St. Petersburg, April 1984, at the invitation of the St. Petersburg Audubon Society with Dave Goodwin as the local committee chairman.—**Marsha S. Winegarner,** Route 2, Box 180, Lake Placid, Florida 33852.

Florida Field Naturalist 12: 24, 1984.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Species index to Florida bird records in Audubon Field Notes and American Birds volumes 1-30 1947-1976, by Margaret C. Bowman. xii + 42 pp. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00. Order prepaid from the Vice-President.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 12, NO. 2 MAY 1984 PAGES 25-48

FORAGING AND FOOD-STORING OF AMERICAN CROWS IN FLORIDA

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Despite their being among the most well known of birds, many aspects of the lives of American Crows (*Corvus brachyrhynchos*) have been little studied, possibly due to their wariness. My wife and I have studied crows for several years (1981-1983) in a situation where they are relatively tame. In this paper I report on our studies of foraging, including the roles of food-storing. There have been only a few brief descriptions of food-storing (George and Kimmel 1977, Hess 1978), as far as I am aware. Bent (1946) gave a short description of the foraging of the Florida Crow (*C.b. pascuus*). What has interested me particularly has been the way the crows at our study site, which are cooperative breeders (Kilham in prep.), varied their foraging during two years of drought (1981-1982) followed by a year of excessive rainfall (1983).

METHODS AND STUDY SITE

The study was conducted in January-May 1981-1983 at the Hendrie cattle ranch, 24 km south of Lake Placid, Florida. The ranch was flat and cattle kept the grass short and the groves of live oaks (*Quercus virginiana*) and cabbage palms (*Sabal palmetto*) free of low branches and undergrowth. The crows were very tame because of years of protection from hunting and other disturbances. We further encouraged their tameness by feeding corn at the end of each morning's observations. Because the crows had to share the corn with wild Turkeys (*Meleagris gallopavo*), Sandhill Cranes (*Grus canadensis*), and feral hogs (*Sus scrofa*), I do not believe that the feedings affected their behavior or energetics to any extent. Feeding enabled us to count the crows, which included two groups of cooperative breeders (Kilham in prep.) of 8-10 birds each. The crows defended group territories of about 50 ha separated by a common boundary. In addition to foraging in the oak groves and pastures, the crows flew into red maple (*Acer rubrum*), bay (*Persea* spp.), and magnolia (*M. virginiana*) swamps, which were dry during the drought.

Florida Field Naturalist 12: 25-31, 1984.

Observations

We observed crows turning over dry cow dung. During the months we studied crows, dry pats were more prevalent in dry years when they became hard on top while retaining moisture underneath. A crow walking in a pasture might suddenly hop, run, or both in hurrying to a cow pat. The crows also flipped over clumps of sod uprooted by feral hogs. The largest objects turned over were the fallen leaves of cabbage palms, a feat that often required shoving with their body as well as flapping their wings.

Crows attacked cabbage palms to dislodge prey. In doing so, they acted cooperatively, with one or two pounding on the hard leaf stalks with their bills or landing noisily on the dry leaves above, while 1-4 crows stood below, looking up, ready to seize whatever might fall. The largest catch from a palm tree that I identified was a snake about 25 cm long. Crows, although attacking palms in the dry years, did so particularly in March 1983, when flooding of fields and woods restricted their foraging elsewhere.

The crows spent much time walking about alone or in well scattered groups, stopping here and there, but seeming to find little for the time spent. I had an impression that the crows had leisure time, even in the dry years, and that this was one way of spending it. It was difficult, however, to determine at any distance, even in short grass, what a crow might be catching. Of crows that perched close to me in a grove, one knocked a long-horn beetle (*Cerambycidae*) and another a large wolf spider (*Lycosidae*) to the ground before seizing it. In pastures I occasionally saw crows running or flying wildly back and forth as if trying to catch grasshoppers. Although the crows sometimes stooped at American Robins (*Turdus migratorius*) and Killdeer (*Charadrius vociferus*) and once tried to catch a small bird struggling in the wind, a robin-sized bird was the only one that I saw a crow carry in its bill and later tear to pieces. The crows caught what I believe were young cotton rats (*Sigmodon hispidus*) on three occasions. Once, a crow, flying low over a pasture, suddenly hovered and dropped to seize the rat in its bill.

Crows eat sand, as do Blue Jays (*Cyanocitta cristata*) (Kilham 1960). I recognized them doing so four times, three times on a beach by a water hole and once by a stream.

In dry years, crows used behaviors I saw little of or not at all in wet years. These included scavenging the heads of exotic walking

catfish (*Clarias batrachus*) caught by river otter (*Lutra canadensis*); feeding on lice of cattle and feral hogs; and attacking young or weakened individuals of large mammals (Kilham 1982a,b and in prep.). Other methods of foraging peculiar to the drought period were digging in the bottom of a dried up marsh, standing by the heads of feral hogs as they rooted in pastures, and feeding, usually by 4-5 crows at a time, on the berries of wax myrtles (*Myrica cerifera*).

Live oak acorns were especially abundant in 1982, and I found crows still feeding on them almost daily in January and February of the wet year 1983. A crow might find an acorn on the ground or fly up into an oak to pick three or four before flying to the pasture with them in its buccal pouch. Once perched on a large cow pat or other "anvil", with an acorn held in its toes, a crow pounded it to pieces. Acorns were also pounded against tree branches.

The crows preyed heavily on frogs during the months of rainfall. After catching frogs in swamps or flooded pastures, the crows usually took them to a dry pasture to pound and devour them. A crow flew toward me on 1 April 1983 with a frog that escaped when the crow landed. After recapturing it, the crow took 8 min to pound, partly devour it, and store what remained. Even small frogs were torn apart before swallowing.

I noted crows (n=11) with walking catfish 13-20 cm long between mid-January and mid-February, when water levels were high and favorable for their capture. I was watching two crows in a shallows where water flowed from a ditch, when the two began running back and forth. One seized a catfish and flew off with it. A crow on 11 February caught a catfish in grass flooded by a nearby swamp. It had hardly started pounding it when a Red-shouldered Hawk (*Buteo lineatus*) swooped down to seize the catfish and, after facing a circle of five excited crows for a few minutes, carried it to an oak. Such kleptoparasitism was not rare, for I noted other instances of it in the dry years (Kilham 1982c). The largest prey I noted a crow working on was an amphiuma (*Amphiuma means*) with a body length of 40 cm minus the head.

When sitting by one nest, I was able to watch crows coming to pick thin, wire-like earthworms 4 cm long, from the wet undersurfaces of sod clumps uprooted by hogs.

The crows spent much of their time well dispersed and foraging more or less alone. But if one crow caught something that required it to stop for a few moments, one or two other crows might fly or walk over. When the prey was anything large or unusual, other

crows flew in almost immediately. On 2 February 1983, seven crows surrounded one that had captured a song bird. They stood with their heads low, and I expected a fight. The crow with the bird walked away after a minute, then flew, pursued briefly by a few crows, until it reached a place where it could feed on its prey alone. I never saw a fight over food. Whatever a crow caught, it kept, regardless of its social status.

When we scattered corn seven to nine crows usually came immediately and filled their buccal pouches before flying 7-100 m away to store the food. Once alone, crows might put their bills into a depression, empty the corn into it, then cover it over with a few quick snatches at dry grass or other debris close by. Occasionally a crow would unload all of the corn with shakes of the head, taking up only a portion, move away 4-7 m to cache it, then return to do the same with another portion. I seldom (n=3) saw crows storing acorns.

Animal prey was likewise stored, especially during the wet year when crows caught frogs or catfishes, items larger than a single crow could eat at once. A crow on 3 March 1983, tearing up a frog held under its toes, walked in four different directions to store portions of it before flying off with what remained. Another crow, after working on a catfish, stuffed 15 cm of its body and tail into a tuft of grass. After covering it with 4-5 pieces of dry turf and cow dung, it returned to conceal the head elsewhere. In attempts to hide the body of the amphiuma, a crow used pieces of dung and a pad of turf 10-12 cm across. Crows did not appear to have difficulty recovering what they stored. One crow, landing 5 m away near where I had seen a fish cached a few hours previously, walked a few steps then ran and hopped directly to where the food was hidden.

Prey was also stored in trees, in the instances (n = 16) I watched, in the long needle tufts of the air plant *Tillandsia setacea*. Most of this caching was in trees within 30 m of a nest where a female was about to lay or was already incubating. A female incubating on 14 March kept giving begging calls as if hungry. When no crow came to feed her, she flew directly to an air plant, level with the nest and 12 m away. She took out the dried remains of a frog, ate it for 2 min, then returned to her nest. At another nest a crow dropped to the ground to catch a yellow-green snake about 25 cm long and carry it into the depths of an oak. The same crow, identified by a broken tail feather, was back on the same oak on the following morning, this time perching above what I supposed was 15 cm of

the same snake. After flying to feed the female on the nest, the crow returned to store the remainder of the snake in an air plant. Crows usually covered such items with bits of debris. On 23 February 1983, when a breeding male came to his mate on the nest, he paused a minute, then dropped to the ground to disgorge the contents of his buccal pouch. After storing half of it a short distance away, he took the remainder and flew to feed his mate. I only saw animal prey stored by nests. I never saw corn fed to an incubating female but if a female saw a crow storing corn from where she sat on the nest, as I noted on 2 occasions, she might fly over and eat it.

Discussion

A feature of the foraging of the crows was that I saw no robbery of one crow by another regardless of its social rank. A similar situation has been noted by Woolfenden and Fitzpatrick (1977) for Scrub Jays (*Aphelocoma coerulescens*) and by Mech (1970) for wolves (*Canis lupis*). Being widespread, the habit may be a crucial one for animals that are cooperative breeders. If robbed of food consistently, juveniles or other subordinates might soon disperse. The surrounding of a crow that had made a capture by other crows was, I suggest, a way information was shared. The incoming crows could form a search image of what any crow might capture for itself.

The territories of crows at the ranch (Kilham in prep) functioned, I think, in their getting to know one area well, a situation which, as shared among the members of a cooperatively breeding group, might have survival value in coping with competitors. Storage for *Corvus* species have been described by Kallander (1978) for the Rook (*C. frugilegus*) and by Simmons (1970) and Hewson (1981) among others, for the Carrion Crow (*C. corone*). With the American Crows on the ranch, storage seemed to be a way of extending harvests in the presence of immediate competition. Cowie et al. (1981) have noted that Marsh Tits (*Parus palustris*), in meeting competition from larger species, may resort to similar strategies of hoarding on a temporary basis. Most birds that store food are territorial. Swanberg (1951) has reported this for the Thick-billed Nutcracker (*Nucifraga caryocactes*) and I (Kilham 1959) for wintering Red-headed Woodpeckers (*Melanerpes erythrocephalus*). A territory enables hoarders to retain possession of what they have (Roberts 1979). A feature of crows at the ranch was the way they stored prey in trees and used it, later, to feed the incubating females.

Summary

In a study on a cattle ranch in Florida, I found that two groups of cooperatively breeding American Crows foraged differently in years of drought than in a year of excessive rainfall. Some methods such as turning over cow dung and ransacking cabbage palms for miscellaneous prey occurred in all years. The largest prey caught with any regularity were walking catfish. What an individual crow caught it retained; the crows never robbed each other. They stored surplus food regularly, sometimes on the ground and sometimes in air plants in trees. Some of the latter stores were placed near nests and were used to feed incubating females. The two groups of crows studied were territorial. The survival values of food storing in relation to food competitors is discussed.

Acknowledgments

Acknowledgments are due to James N. Layne and to Fred E. Lohrer of the Archbold Biological Station, Lake Placid, Florida, and to James H. Hendrie, Sr., and John D. Hendrie for their kindness in permitting my wife and I to visit the ranch.

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REVIEW

Proceedings 1981 crane workshop.—James C. Lewis, editor. (1982). Tavernier, Florida, National Audubon Society. viii + 296 pp. $25.00.—This volume contains 29 of the 30 papers presented at the 1981 Crane Workshop held 25-27 August in Grand Tetons National Park, Wyoming, and 10 additional papers submitted for publication. As a summary of current research on Sandhill and Whooping cranes, it includes papers on migration, population status, nesting, roosting, diet, and on various aspects of captive propagation and reintroduction into the wild.

Two articles are of special interest to Floridians. Stephen A. Nesbitt summarizes the fragmentary history of Whooping Cranes in the southeastern U.S. and especially Florida and outlines a plan to establish a non-migratory population of Whooping Cranes in Florida using resident Florida Sandhill Cranes as foster parents. The three prospective release sites are Three Lakes Ranch Wildlife Management Area (WMA) (Osceola Co.), J. W. Corbet W. M. A. (Palm Beach Co.), and Cecil M. Webb W. M. A. (Charlotte Co.). If the project proceeds on schedule, eggs laid by captive Whooping Cranes at Patuxent Research Center will be first placed in Florida Sandhill nests in spring 1984.

In the second article, Lawrence H. Walkinshaw summarizes his observations made on 135 nests of Florida Sandhill Cranes in Osceola, Okeechobee, and Polk counties during 1938, 1945, 1960, and 1966-1981.

Anyone interested in cranes will want to own this volume. Ornithologists are indebted to The National Audubon Society for publishing this volume as well as the Proceedings of the 1978 Crane Workshop.—**Fred E. Lohrer**, Archbold Biological Station, Route 2, Box 180, Lake Placid, Florida 33852.

NOTES

Ruddy Duck breeds in Tampa, Florida— We saw a lone male Ruddy Duck (*Oxyura jamaicensis*) in resplendent breeding plumage swimming near dense emergent vegetation on a borrow pit pond in northeastern Tampa, Hillsborough County, Florida, on 23 and 28 April 1983. We suspected breeding, but fencing prevented us from searching for a nest or young. When we returned on 30 May we saw a female Ruddy Duck with one downy chick close by her side. Based on size and plumage, we estimated the chick's age to be 3 weeks. Again on 4 and 5 June only the female and her young were observed; the male was not seen on the pond after April. Based on the estimated age of the chick and an incubation period of 3-4 weeks (Johnsgard 1975: 535), incubation must have been in progress when we first saw the male in late April. According to Palmer (1976: 514), seasonal monogamy characterizes the Ruddy Duck; however, the pair bond sometimes breaks during incubation. This could account for his absence after hatching.

On 4 June during a thorough search of the Tampa area by eight parties of observers, only one male Ruddy Duck was found, on an incinerator settling pond near McKay Bay estuary about 11 km south of the breeding site. As it was the only male seen that day, and it was in full breeding plumage, we suspect it was the same male we saw in April on the breeding pond.

We find three previous records of the Ruddy Duck breeding in Florida. All are from northern counties and recent decades: Duval Co., 1964 (Robinson and Stone *in* Stevenson 1964), Columbia Co., 1976 (Menk and Stevenson 1977), Hamilton Co., 1979 (Maehr *in* Ogden 1979). Frequent summer sightings on fresh water farther south suggest other breeding localities may exist for the species in Florida, as in Polk County for example (Geanangel *in* Paul 1981, Fellers *in* Paul 1982).

The normal breeding range of the Ruddy Duck is North America west of the Mississippi River. However, the species has a tendency to breed as lone pairs or in small colonies far from its normal range. Palmer (1976: 509) mapped breeding records for numerous states east of the Mississippi River from Illinois to New Jersey northward into Canada, and one record from Louisiana. In addition Johnsgard (1975: 531) listed a record from South Carolina.

Although breeding in Tampa has not been documented previously, Ruddy Ducks are found locally in June in small numbers. From 1971 through 1983 local birders have participated in a Tampa Summer Bird Count (SBC) organized by William D. Courser. The area covered and rules followed are the same as for the Tampa Christmas Bird Count (see American Birds, 1972-1983). Ruddy Ducks have been found on 9 of the 13 SBCs, the maximum seen was 28 individuals. Virtually all of these records come from McKay Bay where hundreds of Ruddy Ducks spend the winter. McKay Bay is a tidal estuary; its shoreline includes mangroves and mudflats but no extensive marshes. For these reasons Ruddy Ducks are unlikely to breed there. In 1983 (4 June) only the three Ruddy Ducks mentioned above were seen on the Tampa SBC.

We suspect that the Ruddy Duck has become a regular breeder in Florida in recent decades. Possibly an increase in man-made impoundments in Florida has contributed to the species' establishment. The Tampa breeding site is a

recently-dug pit from which earth was removed to build the adjacent Adventure Island amusement park. Roughly rectangular, the pond is about 300 m x 120 m, with two patches of cattails (*Typha* sp.) occupying about 900 square meters of edge. The pond and its shores are enclosed in a chain-link fence, which precludes human access and probably reduces nest predation by mammals. Many waterbirds use the pond, including several species of ducks in winter. On 4 June we found on the pond about 40 Pied-billed Grebes (*Podilymbus podiceps*), 30 Common Moorhens (*Gallinula chloropus*), and 20 American Coots (*Fulica americana*), each species having several broods of young.

Man-made impoundments provide good, albeit temporary, sites for nesting waterbirds in Florida (Ogden 1979, Maehr 1981). The fact that the breeding birds in some of these impoundments include species not known to breed locally in natural wetlands suggests the artificial sites possess locally unique, attractive conditions. Eutrophy and non-wooded shorelines might be two such features that attract Ruddy Ducks.

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Florida Field Naturalist 12: 32-33, 1984.

Play-like behavior of American Crows.—Play has been relatively little described in birds as compared to mammals, although in some families, such as the Corvidae, it appears to be well developed. Other than an incident described by Good (1952), however, I have encountered no accounts of play among wild American Crows (*Corvus brachyrhynchos*). The following observations were made mostly on yearlings (Emlen 1936) in January-May in 1981, 1982, and 1983 at the Hendrie Ranch, 24 km south of Lake Placid, Highlands County, Florida.

On 31 January 1981, I first saw two adults carrying sticks, the stick part of their nest being then nearly complete. At about 1100 on the next day three crows landed 200 m from the nest in a tree, which crows often visited late in the morning to rest and preen. One crow, which I believed to be a breeding adult, rested on a low branch. Two yearlings moved about between the branches and ground, manipulating objects in a play-like manner. I twice saw one hang upside down, swinging from a streamer of Spanish moss as if trying to work it loose. Several smaller clumps were pulled away and briefly carried about, one serving in a tug-of-war between the two active crows. In 1982 I saw yearlings swinging from streamers of Spanish moss on three occasions, with bills pointed toward the ground.

I have seen several instances of play-like behavior with sticks. On 31 January 1981, two crows picked up sticks 7-12 cm long which, like the Spanish moss, they pecked while holding in their toes against a branch. One crow twice flew up into the air with a stick in its bill, dropped, then caught it in its feet before it hit the ground. The two finally perched on either side of a resting crow, each with a 7-cm stick in its bill. None of the crows carried anything away from the tree when they left and none of the sticks was used in nest building. On 9 February 1981, when about 20 m from the nest, I saw a crow pecking at a short stick held in its toes while perched on the back of a cow. When the stick fell, the crow went to the ground and fetched it back up. In the course of wiping its bill on the cow's back, the stick fell again. This time the crow cached it in a tussock of grass about 1.5 m from the cow. After covering the stick with a few pieces of dry cow dung, the crow flew away. On inspection, I found that the stick was a dry, semi-rotten piece of wood measuring 11.5 x 2.3 cm. Because I saw no indication that it contained termites, wood-boring larvae, or food of any kind, I do not believe that the behavior was related to feeding.

I also witnessed a dancing-like behavior in crows. The crows at the ranch took an interest in the various animals with which they associated, perching on cattle and feral hogs (*Suis scrofa*) in search of lice (Kilham 1982a) and pulling the tails of river otter (*Lutra canadensis*) (Kilham 1982b). On 4 February 1981, when two Sandhill Cranes (*Grus canadensis*) began to dance, a crow flew to them immediately. When the cranes danced again, the crow jumped up to as high as 15 cm from the ground and moved in bounces, with wings open, keeping ahead of and among the cranes. I made a similar observation on 6 July 1966 in New Hampshire. About 5 weeks after fledging, a crow I had hand-raised, seeing me from the roof, held out its wings and quivered its tail, an important display of various species of *Corvus* (Goodwin 1976), then picked up a twig and jumped into the air with wings half-spread, turning to one side, then jumping to the other. On the following afternoon I noticed it performing in similar fashion by itself on the lawn. Its leaps with wings out and turns reminded me at the time of the dances of cranes. Another behavior that seemed to be play-like at the ranch was leaping over animals on the ground, as my wife and I saw crows doing, once over a newborn calf and twice over Turkey Vultures (*Cathartes aura*).

Some of the play-like and dance-like behavior observed has been described for other species of *Corvus*. Skead (1952, p. 437), described a family of Black Crows (*C. capensis*) flapping their wings and hopping about in a form of dance on the roof of his farmhouse in South Africa; McKendry (1973) reported a Carrion Crow (*C. corone*) playing with a short piece of wood and maneuvering it from bill to feet in the air; and Gwinner (1966), Ravens hanging upside down. Hanging upside down, however, is not necessarily play. I have observed yearling crows doing so when pushed along a branch by a dominant male, and McIntyre (1953) observed a Carrion Crow doing the same when pursued by another crow. Few accounts of play in wild corvids have stated the age of birds involved. Good's (1952, p. 27) account of a yearling American Crow lying on its back tossing a piece of paper with its bill and feet in March, the month of nest building in Ohio, is of interest in relation to the play of crows with objects in Florida. Play with the feet, while lying on the back has been described for Keas (*Nestor mobilis*), parrots that occupy

in New Zealand "the ecological niche and practice a life-style like that of large corvids in other localities," (Fagen 1981, p. 214-215). The variety of motives involved in play has been discussed by Kilham (1974) and Ficken (1977). One that seems pertinent here is that yearling crows may perform activities that are innate, learned from older conspecifics, or partly both, when they have nothing much else to do, the behaviors being ones that could be functional under other conditions. This was brought out to me at the ranch in 1983 after the above report was first written. A pair of crows lost a first nest in mid-incubation. The breeding female, in what seemed a first move in starting a new one, which she had done by the next morning (27 January), picked up and dropped a few sticks, then swung on a streamer of Spanish moss. Spanish moss is not easy to pull loose. Crows use it to hold large sticks in place at the start of nest building and swinging is one way of obtaining it. Another example of a play-like behavior with a potential function was jumping over a vulture. Crows, in my experience, do not feed on carrion that is surrounded by Black Vultures (*Corgyps atratus*). When two crows were at a well-rotted hog carcass on 19 February 1983, a Black Vulture alighted nearby. One of the crows began walking around it immediately. When the vulture started to walk away, the crow jumped over its back several times as if to keep it moving. When the vulture was 6 m from the carcass, the crow crouched in the grass less than a meter away giving the loudest vocalizations that a Florida crow can make, the "*C.b. pascuus screams*" recorded by Chamberlain and Cornwell (1971). These examples, one relating to Spanish moss and the other to a vulture, indicate, I feel, that acts performed as play can be a way of practicing a skill that may have value later on. The important thing is that one must study the total behavior of an avian species if one is, hopefully, to comprehend anything as complex as play.

I thank Mr. James Hendrie for letting us visit his ranch and James N. Layne for general assistance while my wife and I were staying at the Archbold Biological Station, Lake Placid, Florida.

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Florida Field Naturalist 12: 33-36, 1984.

On describing color abnormalities in birds.—The interesting note by Richardson (1981) entitled "Xanthochromism in the Rose-breasted Grosbeak" raises questions about the terminology and interpretation of color abnormalities in birds. He observed a bird with normal black and white coloration but with a yellow rather than rose breast. Following the definition in the glossary of Van Tyne and Berger (1959), Richardson called this observation an example of "xanthochromism" (which should be spelled "xanthochroism"). The point I shall discuss is that this term has no stable meaning, and furthermore the grosbeak described is unlikely to be an example of the most commonly used meaning of xanthochroism.

Xanthochroism has been used to mean at least five different things. (1) At root (from the Greek *xantho-*, yellow, coupled with *chroa*, color) it should mean simply "yellow coloration," although rarely used thus. (2) In their glossary Van Tyne and Berger (1959: 586) define the term as "*abnormal* yellow coloration" (emphasis added), and taken thus Richardson's use is correct. (3) The commonest meaning in the literature is the more restricted view given by Van Tyne and Berger (1959: 100) in the text: abnormal yellow coloration that is "a special type of schizochroism." This latter term refers to the absence of one pigment from two or more that together produce the normal color, so that the resulting coloration is abnormal. Pettingill (1970: 193) takes a similar, but equivocal, view: "erythrism and xanthochroism *usually* result from the absence of melanin and the retention of red or yellow carotenoid pigments" (emphasis added). (4) The actual example of "xanthochroism" given by Van Tyne and Berger (p. 100)—yellow parrots resulting from the loss of blue in normally green species—may be yet another phenomenon. The authors say that the yellow "apparently results from loss of the dark pigment," but note later that "Blue in feathers is apparently never the result of blue pigment." There is a double problem here. First, a blue pigment *is* known from birds (rhodoxanthin, a xanthophyll producing the blue of fruit pigeons, *Ptilinopus*; see Buckley 1982: 61), although the blue of parrots is almost certainly not based on a pigment (biochrome), but rather is a schemochrome (structural color). Second, the classical notion that all blue-producing schemochromes are due to Rayleigh back-scattering by minute melanin particles is open to question(Hailman 1977: 100-101), as Dyke (1971) has proposed the physical basis to be thin-layer interference with no involvement of pigments of any kind in *Agapornis* parrots. Furthermore, even if the blue of parrots were based on minute melanin particles, loss of blue might not entail loss of pigment—rather it might result from other physical abnormalities in the feather. Therefore, although Van Tyne and Berger (1959: 99) define schizochroism as "the absence of one of the pigments normally present," their example is not clearly such a

case. Insofar as I can determine, the absence of a schemochrome resulting in abnormal coloration due to a remaining pigment has not been given a specific name. Perhaps this is what Van Tyne and Berger meant to infer with the phrase "*special type* of schizochroism" (emphasis added). Finally (5) I have found that some students incorrectly infer that xanthochroism means yellow coloration based on xanthophyll pigments; although this is probably often true, there is a variety of other pigment-types producing yellow coloration (Hailman 1977: 98, table 4-II).

Buckley (in review of the MS for this communication) suggested that a term be proposed for the unnamed phenomenon (4) of the above list. Buckley (1982: 69) pointed out that named schizochroisms are of the phaeomelanin-eumelanin or melanin-carotenoid types, so in parallel I believe phenomenon (4) might be designated a schemo-carotenoid schizochroism. Albeit awkward, the full descriptive term would therefore be "non-schemochrome schemo-carotenoid schizochroism."

An important recent reference should be consulted by anyone interested in avian coloration, Buckley (1982). Buckley recommends abandoning many of the traditional terms for avian coloration because of their ambiguity. In this case, he noted that "The biologist's terms xanthism and xanthochroism, as well as the aviculturist's lutino, are frequently used for birds abnormally colored yellow, but in most cases are used incorrectly, as the phenomenon under observation is usually schizochroism" (p. 68).

Richardson's grosbeak, however, is probably not schizochroic, as there is no evidence that one pigment has been deleted from the normal coloration, leaving a second pigment as the only basis for color. In his bird, it appears that a carotenoid pigment is expressed in a washed-out form. Following Buckley (1982: 68) these abnormalities should be termed "carotenism of degree (intensity)." The cases Richardson cited from Gross (1965) are clearly a mixed bag. One Evening Grosbeak (*Coccothraustes vespertinus*) was schizochroic, with normal melanin absent, but the other bird is not adequately described. Similarly, the Purple Finch (*Carpodacus purpureus*) is not described, but likely to be a carotenism of degree, as are the cited Ruby-crowned Kinglets (*Regulus calendula*) with yellow or orange crown spots in place of the normal red. The yellow female Northern Cardinal (*Cardinalis cardinalis*) is also probably a carotenism of degree, but the Eastern Bluebird (*Sialia sialis*) cited is not sufficiently described for identification of the abnormality. Frustratingly, Gross (1965) provided authors and years for each case, but no bibliography so that the original descriptions cannot be traced directly from his paper.

I have not attempted to review the literature since Gross (1965), but two studies are instructive. In a carotenism-of-degree case involving tropical tanagers with red and yellow rumps, Brush (1970) found only one pigment—an unnamed hydroxy-carotenoid—and suggested that red-rumped birds might be genetically homozygous while yellow-rumped birds would be heterozygous for the same gene. Other cases called xanthochroism in the original reports (e.g. Schnell and Caldwell 1966) probably *are* melanin-carotenoid schizochroisms (see Buckley 1982: 69-70).

In sum, it is perhaps more important than ever to report abnormally colored birds so that we can gain a greater understanding of the pigmental and genetic bases of avian coloration. However, terms that are used am-

biguously in the literature, or that connote an unwarranted interpretation of the coloration observed, should be avoided in descriptions. I recommend using straightforward titles such as "Yellow replaces rose in the coloration of a Rose-breasted Grosbeak" or similar descriptors.

I am grateful for comments on the manuscript by Paul A. Buckley, an unnamed reviewer, and Editor James Kushlan; their suggestions helped to make this complicated subject much clearer.

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Florida Field Naturalist 12: 36-38, 1984.

Further comments on a white Brown Pelican.—Nesbitt and Barber (1979, Fla. Field Nat. 7: 6) described several observations of an almost completely white Brown Pelican (*Pelecanus occidentalis*) near New Smyrna Beach, Volusia County, Florida, between December 1977 and July 1978. During July 1982, the current authors twice saw a white Brown Pelican in the same area. On 7 August, Fisher and Roberta Lawrence captured and banded (519-72124) this bird just north of the SR 44 bridge over the Intracoastal Waterway in New Smyrna Beach. This location was approximately halfway between the two given in the 1979 account and near the New Smyrna nesting colony that was active during the preceding three nesting seasons. This banded individual has been seen several times since, most recently in October 1983.

In August 1982, the bird was nearly completely white; the neck and back of the head showed traces of the brown that characterize adults in breeding condition. These characteristics were not observed in the bird seen in 1978. The underwings, leading edge of the wings, belly, and flanks also had some scattered brownish feathers. All brown plumage was lighter than the normal color. The irides were the same light greenish-cream, and the legs, pouch, and bill were yellowish as the previously reported pelican. The overall appearance

was that of a mostly white, i.e. leucistic, adult. Color photographs taken at that time are on the cover of the Florida Naturalist 55(5), December 1982. By October 1983, the bird had darkened substantially. It had the appearance of a typical adult, even to the point of a yellowish crown. Though it is still distinctly lighter than a normal pelican.

As noticed in the 1979 account, the occurrence of a white or nearly white Brown Pelican has never been reported. For this reason and because subsequent to banding this individual has been seen regularly in the same area, it is possibly the same individual referred to in the 1979 note.

The earlier description of the bird as "albinistic" was intended to imply "tending toward an albino condition." Based on the valuable comment received from J. P. Hailman a more appropriate designation would be non-eumelanin schizochroism, the lack of eumelanin causing the pale, leucistic appearance.

Stephen A. Nesbitt, Florida Game and Fresh Water Fish Commission, Wildlife Research Laboratory, 4005 South Main Street, Gainesville, Florida 32601, and **R Patrick Fisher**, Endangered Species Protection Fund, P. O. Box 8303, Orlando, Florida 32856.

Florida Field Naturalist 12: 38-39, 1984.

Synchronous diving by Hooded Mergansers.—Synchronous diving, although a well known phenomenon in mergansers, apparently has not been recorded for Hooded Mergansers (*Mergus cucullatus*). On 14 January 1974, on the Indian River, near Titusville, Brevard County, Florida, I observed a party of nine Hooded Mergansers. I often saw them swimming in line, and these birds generally kept together as a flock. The two recognizable adult drakes in the group apparently were not its dominant members. I observed vigorous and often excited scurrings across the surface of the water with some 'food-scanning', thrusting their heads below the surface with quick side-to-side movement. Apparently when food was found, synchronized diving by all members of the flock occurred. Within a few seconds of one another, each member of the flock disappeared for fewer than twelve seconds. With the reappearance of the first Hooded Merganser, the others soon surfaced. Independent diving of individuals also occurred but was less in evidence.

I have seen similar behavior in other species of *Mergus*. On 11 November and 2 December 1962, in Teignmouth in the county of Devon, England, on the turbid waters of the River Teign, I frequently saw 24 Red-breasted Mergansers (*M. serrator*) 'food-scanning' and diving together on the rising tides. I have also seen 'food-scanning' and synchronous diving by small groups of Red-breasted Mergansers on the Cornish coast in the English Channel and Atlantic, and on inland pools of brackish water. In addition prior to severe arctic weather in Britain in the winter of 1962, forty Common Merganser (*M. merganser*) arrived on some of the few pools of the large frozen Chew Valley Lake (500 h) in Somerset (now Avon), West Country, England. Vigorous synchronous diving by the Goosanders occurred during their short stay.—**Bernard King**, Gull Cry, 9 Park Road, Newlyn, Penzance, Cornwall, England.

Florida Field Naturalist 12: 39, 1984.

The black bear as a seed disperser in Florida.—Although the importance of wildlife in disseminating seeds is well recognized (Martin et al. 1951:19, Thompson and Willson 1979, Foster 1982), black bears (*Ursus americanus*) traditionally have not been considered seed dispersers. However, Rogers and Applegate (1983) recently found that black bears were important seed dispersers in Minnesota and that germination rates of seeds of several plant species were improved by acid and mechanical scarification during digestion. The food habits of the Florida black bear have been described in detail by Maehr and Brady (1984, in press a,b). In this paper, I discuss black bear food habits in Florida with respect to seed dispersal.

During March 1982, nine scats were collected in an Atlantic white cedar (*Chamaecyparis thyoides*) seep in Ocala National Forest, Lake County, Florida. Associated vegetation included bald cypress (*Taxodium distichum*), cabbage palm (*Sabal palmetto*), needle palm (*Rhapidophyllum hystrix*), and water oak (*Quercus nigra*). In January 1983, seven scats were collected near beeyards (see Maehr and Brady 1982) in the Golden Gate Estates, Collier County, Florida. Associated vegetation included bald cypress, red maple (*Acer rubrum*), cabbage palm, and saw palmetto (*Serenoa repens*). Visual estimates of scat volumes were made and the volume of each food item was categorized as trace, 1-25, 26-50, 51-75, or 76-100%. Numbers of seeds in the scats from Collier County were estimated to determine germination rates.

All scats collected in the Atlantic white cedar seep in Ocala National Forest were predominantly composed of cabbage palm seeds, with red bay (*Persea borbonia*) and needle palm seeds each occurring twice at a lower percentage of total volume (Table 1). Collier County scats were predominantly composed of Brazilian pepper (*Schinus terebinthifolius*) seeds, with cabbage palm and unidentified monocot leaves each occurring once (Table 1).

TABLE 1. Seeds in Florida black bear scats.

Species	Frequency of percent volume				
	Trace	1-25	26-50	51-75	76-100
OCALA NATIONAL FOREST					
Cabbage palm					9
Red bay		2			
Needle palm		2			
COLLIER COUNTY					
Brazilian pepper					7
Cabbage palm		1			
Unidentified monocot leaves	1				

I found germination of cabbage palm seeds in two scats and red bay seeds also in two scats in the collection from Ocala National Forest. In five of seven scats from Collier County, Brazilian pepper seeds showed evidence of germination, but the few cabbage palm seeds did not. The germination rate of Brazilian

pepper averaged 25.7% of the seeds present (range 0-60.0%, SD = 21.30), or an estimated 200-1000 sprouts per scat. We did not test experimentally whether digestion increased germination of seeds eaten by black bears in Florida. However, if the findings for Minnesota bear foods (Rogers and Applegate 1983) parallel the Florida situation, an increase in germination as the result of passage through the gut probably does occur, in that most of these plant species have seeds that are typically dispersed by animals (Martin et al. 1951).

Since the introduction to Florida of this exotic shrub in the 1800's, Brazilian pepper has spread rapidly and now threatens the integrity of native south Florida ecosystems (Craighead 1971:148) because of its ability to colonize both disturbed and undisturbed sites (Workman 1978). It is of interest that Brazilian pepper is eaten by bears in winter when very few native fruits are available (Ewel et al. 1982:120). Ewel (1978) and Ewel et al. (1982:37) listed raccoons (*Procyon lotor*) and oppossums (*Didelphis virginianus*) as important dispersers of *Schinus* in as much as seed clumps are deposited in a nutrient-rich material and are transported away from the parent plants. Because of larger scat volume and potentially extensive daily movements (1-10 km/day), black bears may distribute more seeds further than other mammals. However, the importance of birds in brazilian pepper seed dispersal should not be overlooked. Because of their large wintering flocks, American Robins (*Turdus migratorius*) probably distribute many small clumps of seed more widely than bears.

It is often assumed that an increased mast supply should improve the quality of wildlife habitat. However, the use by bears of Brazilian pepper drupes in south Florida may confound a situation where losses in bear habitat have occurred due to agricultural and urban growth. In that black bear food consumption reflects temporal and geographical changes in the fruiting phenology of important plant species, the eating of brazilian pepper drupes by black bears in south Florida is not surprising. Maehr and Brady (1984) found that about 80% of the food volume eaten by bears was plant material and that regional differences reflected the local abundance of plant species. As Brazilian pepper continues to spread and dominate some south Florida plant communities, black bears can be expected to increase their use of this plant. It is unknown to what extent native food plants used by black bear will be affected. Certainly, successional patterns on disturbed sites have already been altered where Brazilian pepper has established. One can only speculate on the consequences in undisturbed plant communities. Further investigations into the nutritive value of Brazilian pepper drupes and competition between Brazilian pepper and native plants are needed to clarify the role this exotic may play in black bear ecology.

Assistance with specimen collection was provided by L. Cutts, J. McGrady, and J. Rodgers. I thank J. Ewel and J. Rodgers for making valuable comments on the manuscript. This is a contribution to Federal Aid to Wildlife Restoration W-41-R.

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Florida Field Naturalist 12: 40-42, 1984.

Persistent predation by American Swallow-tailed Kites on Eastern Kingbirds.—Recently, Lohrer and Winegarner (1980, Fla. Field Nat. 8: 47-48) summarized the records of American Swallow-tailed Kites (*Elanoides forficatus*) preying on nestling birds and suggested that such predation may be relatively frequent. Since then, Skutch (1981, Publ. Nuttal Ornithol. Club No. 19, pp. 180 and 227) reported predation on the Clay-colored Robin (*Turdus grayi*) and the Golden Masked Tanager (*Tangara larvata*) in Costa Rica. In this note we add to the list the Eastern Kingbird (*Tyrannus tyrannus*) in Florida, and present observations that indicate Swallow-tailed Kites can be persistent predators at the nests of small birds.

On 12 July 1981 at 1200, 5 km south of Lake Placid, Highlands County, Florida, in a sparsely-populated subdivision, we noticed two American Swallow-tailed Kites being chased from the vicinity of a kingbird nest by an Eastern Kingbird. At a distance of 100 m, we could easily see an object in the talons

of the adult kite and that the following kite was a short-tailed juvenile. About 100 m from the nest the kingbird ceased calling and diving on the lead kite, and the kite began soaring upward while plucking feathers from its prey. With binoculars, we identified the prey as a well-feathered nestling Eastern Kingbird with a short tail, because it had a distinct bicolored appearance with no trace of wing patches or any distinctive markings elsewhere on the body. As we watched the high-soaring adult kite, it made a steep stoop almost to the ground, and at the bottom of the stoop another kite flashed by from the opposite direction. This pattern was repeated twice, but we did not see the kites transfer prey. The kites eventually drifted out of sight. About 15 min after the initial sighting and soon after we lost sight of the kites, two kites appeared from the direction in which the first two departed. They flew close to the ground in flapping flight directly to the kingbird nest tree, a 13 m slash pine (*Pinus elliotti*) about 8 m from a house. When one of the kites approached the nest tree it swooped high over the tree and dove straight down among the branches to pause briefly at the kingbird nest on the lowest branch. The kite flew away rapidly carrying a nestling with only a brief chase and little scolding by the kingbird. The other kite (age undetermined) followed closely almost as if it were trying to steal the prey. About 1 min later a juvenile kite flew to the kingbird nest and then flew toward the other kites.

About 30 min later an adult kite flew leisurely toward the kingbird nest where it was met by a scolding kingbird. The kite swerved off and spent the next 15 min slowly gliding back and forth below the canopy in a nearby grove of slash pines and cabbage palms (*Sabal palmetto*) among some houses, as if it was searching for birds' nests. The next day no kingbirds were seen in the area, suggesting that the kites took all the nestlings. For several days thereafter we saw one or two kites within 1-2 km of the area and once we saw a juvenile kite perched in a snag while an adult kite flew low over the nearby trees.

These observations suggest the following: adult kites with fledglings carefully hunt over the same area probably searching for birds' nests; once they find a nest the kites return until it is emptied; close proximity to residential areas is no deterrent to kite predation. Kermott (1981, Raptor Res. 15:94-95) described a similar situation of persistent predation by Merlins (*Falco columbarius*) on nestling American Robins (*Turdus migratorius*) in suburban Big Sky, Montana.—**Charlotte E. Lohrer** and **Fred E. Lohrer**, Archbold Biological Station, Route 2, Box 180, Lake Placid, Florida 33852.

Florida Field Naturalist 12: 42-43, 1984.

Revision of flock movement rate table.—In a recent paper (Gaddis 1983, Fla. Field Nat. 11:25-34) Table 3 was found to be incorrectly presented. I have revised the table and present it here (Table 1).

The revised table shows the overall daily trend (a reduced flock movement rate at midday) to be more consistently manifested in the monthly categories than they were in the unrevised table. Only in the month of February do the movement rates depart from this pattern to show the slowest rate in the morning. The sample sizes for the individual time periods in March, however, are probably not large enough for reliable comparison. The seasonal increase

TABLE. 1. Flock movement rates (m/h) ± SD by month and by times of day.

Time of day	Dec.-Jan.	February	March	Total
0700-1000	362.5 ± 118.6 N = 8	273.3 ± 131.04 N = 11	604.9 ± 195.3 N = 4	362.03 ± 179.3 N = 23
1000-1400	267.5 ± 122.5 N = 17	303.1 ± 148.01 N = 10	234.7 ± 166.1 N = 4	274.8 ± 133.6 N = 31
1400-1800	355.6 ± 62.2 N = 4	453.7 ± 191.4 N = 5	280.0 ± 147.7 N = 3	377.6 ± 154.1 N = 12
Total	305.9 ± 121.1 N = 29	319.5 ± 159.0 N = 26	381.7 ± 236.2 N = 11	323.9 ± 159.2 N = 66

in movement rate, as shown in the unrevised table, is unchanged in the revised form. Other conclusions and speculations based on the movement rates also are unchanged.—**Philip K. Gaddis**, 52 Lakeview Ave., Piedmont, California 94611.

Florida Field Naturalist 12: 43-44, 1984.

Dangle feeding by the Green-backed Heron.—In his paper "Feeding behavior of North American herons," Kushlan (1976, Auk 93:86-94) did not mention a method of feeding observed being used by a Green-backed Heron (*Butorides striatus*). While visiting the late Eleanor J. Brumbaugh in Jacksonville Beach, Duval County, Florida, 28 July 1976, I watched a Green-backed Heron feeding from a rope extending between shore and Mrs. Brumbaugh's dock on a canal intersecting the intracoastal waterway. The bird moved slowly along the rope until it was about one meter from shore, then leaned forward and after a brief waiting period, rapidly extended full length into the water. The bird's legs, though fully extended, never left the rope. The bird regained its position on the rope without using its wings. This behavior was repeated three times within ten minutes. On the second attempt, a fish approximately ten centimeters long was secured. Mrs. Brumbaugh said she'd seen the bird doing this a number of times before. Using Kushlan's classification system, this feeding technique might be classified as an incomplete "dive" (Meyerriecks 1960, Publ. Nuttall Ornithol. Club 2) or a combination of the "stand and wait" and "dive" techniques. In a natural situation, the technique could be employed from an overhanging limb or vine. Though this behavior probably represents a point on a continuum between standing and diving it seems unique enough among heron feeding strategies to warrant comment.—**Stephen A. Nesbitt**, Florida Game and Fresh Water Fish Commission, 4005 South Main Street, Gainesville, Florida 32601.

Florida Field Naturalist 12: 44, 1984.

An unusual roosting site for a Carolina Wren (A wren in my pants).—It is well known that Carolina Wrens (*Thryothorus ludovicianus*) will nest seemingly anywhere, often to the consternation of mailbox owners, and the like. Still it was surprising to find a wren roosting in my jogging shorts (Fig. 1). There was regularly a pair or two of shorts on the clothesline, and for about a year (November 1982 through October 1983) a wren was roosting in them whenever I retrieved a pair late in the evening. The regularity of use in spite of frequent disturbance, perhaps 15 times in the last year, and the rather unusual nature of the site prompted this note.—S. A. Nesbitt, Florida Game

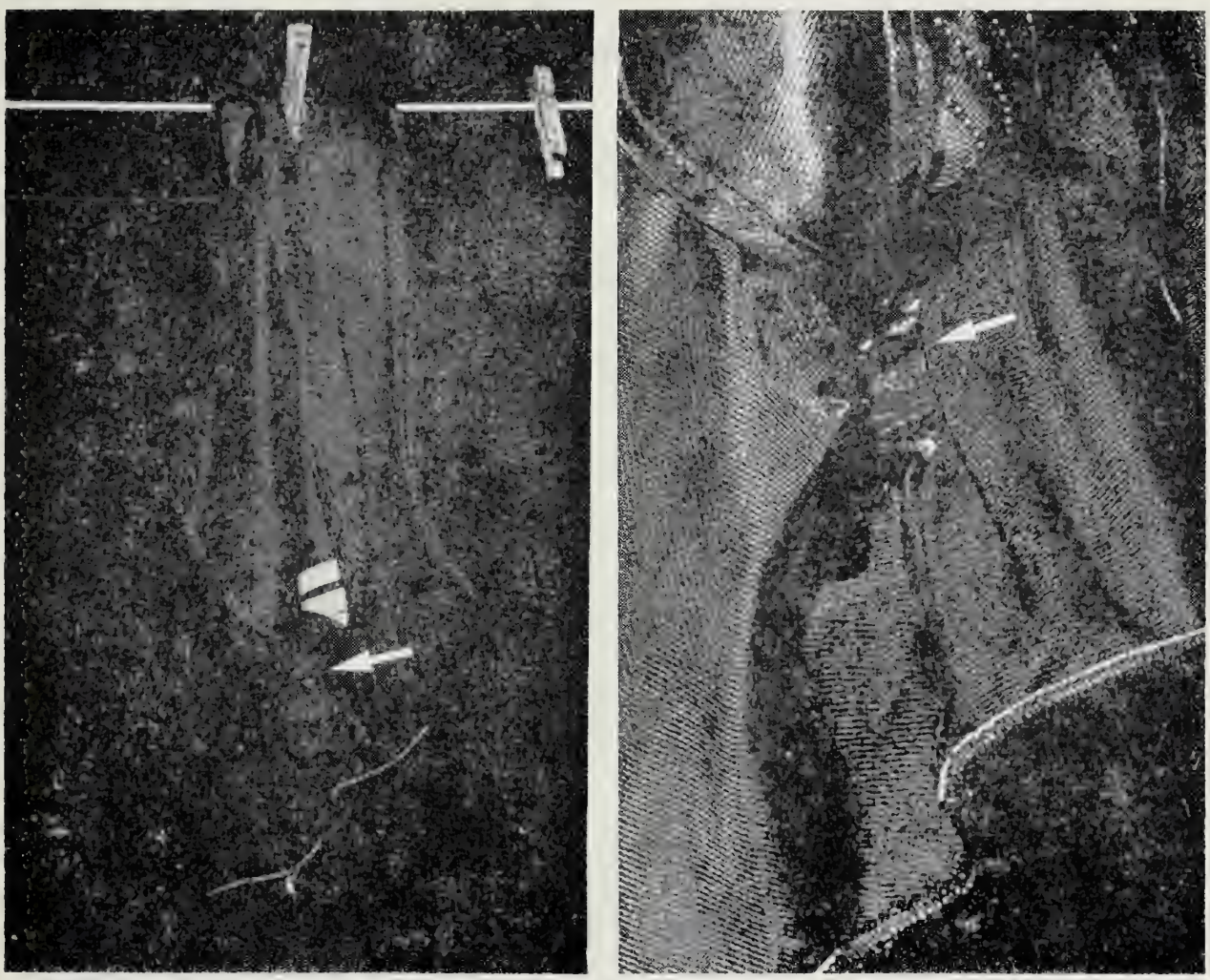

Fig. 1. Carolina wren roosting site in a fold in a pair of nylon jogging shorts. The bird's tail and wing are exposed, indicated by the arrows.

and Fresh Water Fish Commission, Wildlife Research Laboratory, 4005 South Main Street, Gainesville, Florida 32601.

REVIEWS

Nature guide—8th edition.—Tahoma Audubon Society, 34915 4th Avenue South, Federal Way, Washington 98003. $6.00 plus $1.50 postage.—All naturalists who travel will find this directory useful because it contains a wealth of material that will enable them to zoom in on special birds in particular places and because of its additional natural history information. Listed are names, addresses and telephone numbers of local birders and guides in the United States (29 for Florida), Canada, Mexico, and some 30 other countries in Central and South America, Europe, the Middle East, the Western Pacific, and Africa.

Symbols following the names of the guides indicate the particular interest, if any, of each guide, with birds being assumed to be of universal interest. Other listed interests include botany, edible wild foods, geology, mammals, insects/butterflies, mushrooms, natural history, photography, reptiles/amphibians, trees, wildflowers, wildlife artists. This classification index could be invaluable.

Other information includes: detailed directions for 10 U.S. and one Canadian hawkwatching lookouts with some contacts; telephone numbers for Rare Bird Alerts in more than 30 cities; 2 maps (U.S. National Wildlife Refuges and National Wildlife Areas of Canada); a list of suggested publications (books and magazines) for reference; and nature centers in the U.S. and Canada listed by cities, with 64 for Florida. We noted one error—under nature centers in New York City—Rockland Lake is listed as 18 miles south of NYC when in fact it is north of the city.

The Seattle Audubon Society offers a Code of Birding Ethics, which includes actions relating to thoughtfulness of birds, thoughtfulness of habitat, and thoughtfulness of birders—good suggestions to follow.

We are listed in this guide, and we occasionally receive telephone calls and letters. We try to direct the enquirer to the birds they are seeking and suggest suitable birding spots.

We have used this guide on several occasions, most recently on a July birding trip to British Columbia. Before leaving home we contacted (by letter) a listing from Victoria on Vancouver Island, and we made a telephone contact in Vancouver city upon arrival. The information we received led to some spectacular sightings in both locations. Our Vancouver contact brought us a Blue Grouse that performed its amazing display within a few feet. Our Victoria contact directed us to a possible location for the introduced Eurasian Skylark. During our stop for the Skylark we observed a handsome male Yellow-headed Blackbird, a "vagrant" in Victoria, that subsequently was featured on the Victoria Hotline. Then came an unbelievable sighting of 2 Curlew Sandpipers—a bird that had only been dreamed of and admired in our field guide!

In Victoria we were invited to meet with a group that each Tuesday morning searches out the "good" birds and visits locally productive spots. At the first stop, we found the earliest migrating Black Turnstones of the season. The group was interested to see that we found the birds we wanted. Other

people we have contacted in Manitoba and Texas through this guide have responded just as eagerly as our British Columbia contacts and done their utmost to assist us.

Thus, having been on both ends of the information exchange, we endorse the cooperative spirit on which this nature guide is founded, and we regard this 8th edition as a helpful addition to any trip and recommend it.—**Stanley Stedman and Annette Stedman,** 1156 Casey Key Road, Nokomis, Florida 33555.

Florida Field Naturalist 12: 46-47, 1984.

The Living Bird Quarterly.—Published by the Laboratory of Ornithology at Cornell University, 159 Sapsucker Woods Road, Ithaca, New York 14850. "Free" to members of the Laboratory; but annual membership is $25.—Cornell University's Laboratory of Ornithology has a rich and honored tradition of promoting the knowledge and appreciation of birds in North America. Cornell was the first institution on the continent to grant advanced degrees in ornithology; a list of its graduates is a Who's Who of Ornithology (e.g., Dean Amadon, Stephan Eaton, Ernest P. Edwards, John Emlen, Robert and Millicent Ficken, and Ludlow Griscom only get us a quarter-way through the alphabet). In the early 1960s when the Laboratory considered an annual publication, board member Roger Tory Peterson urged that the journal be aimed at amateur ornithologists as well as professionals, and he suggested the name The Living Bird. The first annual Living Bird, published in 1962, quickly established itself as unique among bird journals. It published major reviews of disciplines and taxonomic groups, original reports of research, and exciting new discoveries and all were combined with beautiful art and photography. The Living Bird continued annually through 1978; a biennial was published for 1979-1980.

In truth Peterson's desire for a lay-oriented journal was never really satisfied by The Living Bird beyond the aesthetics of its art; the annual was too technical to appeal to a wide audience. The future of The Living Bird is unclear; it may resume. Meanwhile, the Leboratory has designed The Living Bird Quarterly "to present current research and other technical ornithological information in a manner easily understood by nonprofessionals." The first issue was for Summer 1982; now four issues are available, allowing an assessment of the journal's first year of published material.

Anyone interested in birds should enjoy seeing this journal. An 8½ x 11 inch, 25-30 page package allows easy handling. The color is lavish and well-registered. The art and photography are excellent. Articles are nicely written and illustrated but more importantly, they are authoritative. Included are migration papers by Brian Harrington and Charles Walcott, Walter Spofford on raptors, and Tom Cade on Peregrine Falcons. James L. Gulledge in "Sounds we call songs," the first of a series of articles on bird communication, presents the acoustics of bird song in a manner that avoids the normally dry technical quality of the subject. A soundsheet included with the article reproduces the lovely songs of thrushes first normally and then at one-quarter speed, the latter revealing an extraordinary complexity. A valuable part of each issue is the Research & Review section, which presents readable synopses of research reports from technical journals such as Animal Behaviour, Oecologia, and The American Naturalist.

If the journal will please nearly everyone interested in birds, should we all rush to subscribe? It is expensive: $25 a year when a comparably-formatted journal, National Wildlife, gives two more issues and many more pages for only $10.50 a year. And there are so many journals aimed at bird watchers these days. Part of the $25 goes to support the work of the laboratory, however, and that is a worthy effort. Also, membership provides discounts on purchases from the Lab's bookstore. Thus, The Living Bird Quarterly, even though a quality publication, would have to be placed down a few notches on my priority list for serious Florida birders, certainly no higher than third (below Florida Field Naturalist and American Birds). It can be highly recommended, however, as a pleasing yet authoritative introduction to the fascinating biology of birds for those wishing to progress beyond the listing stage.—**Robert L. Crawford**, Tall Timbers Research Station, Rt. 1, Box 160, Tallahassee, Florida 32312.

Florida Field Naturalist 12: 47-48, 1984.

Florida's fabulous waterbirds: their stories.—Winston Williams. 1983. National Art Services, Inc., P.O. Box 24339, Tampa, Florida 33623. 243 color photographs, pages not numbered. $7.95 paperback.—The clean, sharp reproduction, and excellent color of the photographs are a marvel of printing. Moreover many of the shots show difficult but very successful stopping of action. The most conspicuous and interesting of Florida's waterbirds are included, making it a fine book for Floridians with a casual interest in birds as well as visitors to our state who wish to know what species they see. The photographs are exciting enough to arouse the interest of children and may stimulate them to continue bird watching.

There are some errors in the text. A Sandwich Tern is labeled Common Tern. The text states the tern is in summer plumage though it is in winter plumage. Discussion of gulls is so simplified as to be misleading. Bonaparte's Gull, regular in Florida in winter, as well as several uncommon visitors, are smaller than the Laughing Gull. The bodies of our adult gulls are white (though they may have streaks or spots on the head in winter) and all have conspicuous mantles that vary according to the species from pale gray to blackish.

There is no comparable book about Florida waterbirds, and it deserves success. Bird photographers will want a copy because the photographs are so beautiful and because it challenges them to reach for higher excellence in their own work.—**Helen G. Cruickshank**, 1925 South Indian River Rd., Rockledge, Florida 32955.

Florida Field Naturalist 12: 48, 1984.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 12, NO. 2 MAY 1984 PAGES 25-48

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 12, NO. 3 AUGUST 1984 PAGES 49-80

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The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 12, NO. 3 AUGUST 1984 PAGES 49-80

THE HISTORY OF THE LAUGHING GULL POPULATION IN TAMPA BAY, FLORIDA

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The Laughing Gull (*Larus atricilla*) breeds locally on the Atlantic coast from southern New Brunswick, Canada, through Florida and the Caribbean, and on the Gulf Coast from Florida to Texas (AOU 1983). We censused all Tampa Bay, Florida, Laughing Gull colonies in 1981 and were impressed by the large population size. Consequently, we have reviewed the literature and notes of local biologists to assess the status of the population in this area from the earliest available published accounts to the present.

Numerous records of nesting Laughing Gulls exist from the Tampa and St. Petersburg area, perhaps because of the large number of observers there. The earliest historical accounts we found of Laughing Gulls nesting in Tampa Bay were from the late 19th century. These records, provided primarily by collectors and naturalists on their trips to Florida, described the devastation of Gulf Coast waterbird populations by hunters in the millinery trade (e.g. Scott 1887, 1888). In 1933, the National Association of Audubon Societies initiated its Tampa Bay Bird Project and hired its first full time warden, Fred Schultz (Mills 1934). Schultz's primary duty was to protect several bird colonies in Tampa Bay, but he, as well as some of his successors, occasionally reported on the status of bird colonies in the Tampa Bay region that were not under the Association's jurisdiction. In the 1960's and 1970's, published and unpublished records in the Bay Area provided an estimate of the size of the Laughing Gull population. In 1981 and 1982 we censused all Tampa Bay Laughing Gull colonies.

In this paper, we review the history of the Tampa Bay Laughing Gull population from the late 1800's to the present. We also discuss factors that may have affected the recent growth of this population.

Methods

We reviewed the following journals and years: American Birds (1947-1983); Auk (1884-1982); Bird-Lore (1899-1940); Bulletin of Nuttall Ornithological Club (1876-1883); Florida Field Naturalist (1973-1983); Florida Naturalist (1927-1983); Journal of Field Ornithology (1930-1983); and the Wilson Bulletin (1891-1983). We also examined unpublished accounts from the field notes of Brian A. Harrington, Richard T. Paul, Sievert A. Rohwer, and Glen E. Woolfenden.

For our own censuses we used a quadrat sampling technique with circular plots (Cox 1976) to estimate population size at all Bay Area colonies in 1981 and 1982. A stratified random sampling procedure was used to census nests in representative vegetation types. Nest counts from ten 100 m^2 plots were extrapolated to the total area occupied by nesting gulls. Partial nest counts were used rather than total nest counts to avoid prolonged disturbances in the colonies. Counts were made during late incubation; only nests with eggs were used to estimate the total nesting population. All population estimates provided in this paper are numbers of nesting pairs, one pair per nest counted.

Results

Figure 1 and Table 1 summarize all sites known to us in Tampa Bay where Laughing Gulls have been recorded. Passage Key and keys near Pass-A-Grille, including Shell Key, are natural keys or beaches that have remained undeveloped. The remaining eight sites are spoil islands created since 1930 (Lewis and Lewis 1978).

We know of only two sites in Tampa Bay used by nesting Laughing Gulls prior to 1900. These sites are Passage Key at the mouth of Tampa Bay and "low sand islands and bars off Pass-A-Grille" (Scott 1888). In his visits to these sites in the early 1880's, Scott (1888) reported that "countless hosts of Terns, Gulls, and Black Skimmers" (*Rynchops niger*) nested at these sites. In 1888, Scott (1888) sent Dickinson and Parkes to these sites to inspect the bird colonies. Only Black Skimmers were reported nesting, and few Laughing Gulls were observed. Scott concluded that persecution by plume hunters and depradation by egg hunters had nearly extirpated the gull and tern populations.

From 1901 to 1920 the Tampa Bay Laughing Gull population increased following cessation of market hunting. During this period, Passage Key was the only active Laughing Gull colony site recorded in the Tampa Bay region (Table 1).

We found no records of nesting near Pass-A-Grille during this 20-year period although nesting habitat may have been available. The natural sand bars near Pass-A-Grille support herbaceous vegetation amongst areas of bare sand and shell and are maintained by periodic flooding. Historically, such sites probably were suitable for gulls provided that human disturbance was minimal.

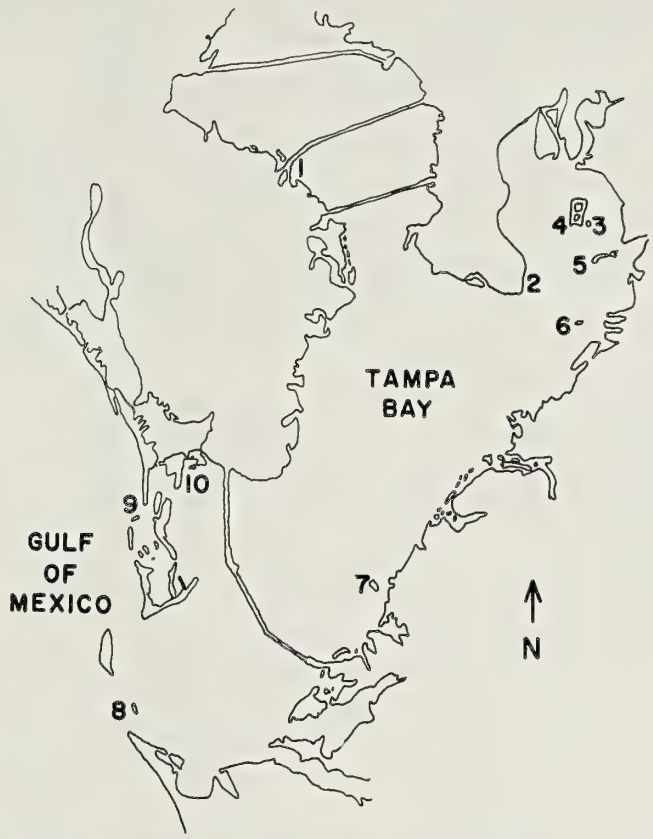

Fig. 1. Laughing Gull colony sites in Tampa Bay, 1880-1982. 1. Howard Frankland Bridge; 2. Gadsden Point Spoil Bank; 3. Fantasy Island; 4. North Spoil; 5. Alafia Banks (I-59); 6. Island I-61 (I-61); 7. Port Manatee Spoil (I-66); 8. Passage Key; 9. Pass-A-Grille; 10. Bayway (I-49B). Numbering system of Schreiber and Schreiber (1978) is in parentheses.

Passage Key was an important colony site for Laughing Gulls during the 1920's and 1930's. In 1921, a hurricane obliterated the island. Shortly after, deposition of sand rebuilt the island and gulls in smaller numbers used it for nesting (Howell 1932). By 1935 Laughing Gulls nested on Passage Key in large numbers (Schultz 1936).

The islands south of Pass-A-Grille as well as Pass-A-Grille Beach supported small colonies of Laughing Gulls during the 1920's (Table 1). In 1935, a search by Schultz (1936) of islands in this region failed to locate any active Laughing Gull colonies. His observations of campers at these sites suggests to us that human disturbance had caused the birds to abandon these colonies.

The first dredged-fill islands were created in Tampa Bay in 1931 when the Alafia Banks spoil islands (Bird and Sunken islands) were built by the United States Phosphoric Products Corporation in a harbor deepening project (Mills 1934). These sites along with several other spoil banks created during the 1960's and 1970's became important gull nesting sites during this century. Laughing Gulls first colonized the Alafia Banks site, Bird Island,

TABLE 1. Summary of records of Laughing Gull nesting in Tampa Bay, Florida from the 1880's to 1980.

Year	Site name: estimate of population size	Source
Early 1880's	Passage Key and Pass-A-Grille: "countless hosts of Terns, Gulls, and Black Skimmers nested."	Scott (1888)
1888	Passage Key and Pass-A-Grille: on 2 July "The only Gulls that were noted on this expedition were a few Laughing Gulls."	Scott (1888)
1906	Passage Key: "many" nesting Laughing Gulls	Pearson (1907)
1908	Passage Key: "a good many young gulls are flying and we think by next month they all will be through nesting."	Dutcher (1908)
1912	Passage Key: Pillsbury estimated "that 1,200 birds nested and 1,000 young were raised."	Howell (1932)
1921	Passage Key: Hurricane in October 1921 totally washed over the island; the site was rebuilt shortly after. "now . . . gulls in smaller numbers still use it"	Howell (1932)
1922	Pass-A-Grille: Laughing Gulls reported nesting	Howell (1932)
1926	Pass-A-Grille: "400 present on breeding ground south of Long Key"	Fargo (1926)
1927	Pass-A-Grille: Nesting Laughing Gulls reported	Howell (1932)
1934	Alafia Banks: 1,000 pairs nesting on Bird Island	Mills (1934) Lehman (1938)
1935	Passage Key: 22,000 nesting birds; "Laughing Gulls predominating; about 20% were Black Skimmers; 2,000 Royal Terns" From these data extrapolate that roughly 7,800 pairs of Laughing Gulls nested.	Schultz (1936)
	Alafia Banks: 1,500 pairs of gulls nested on Bird Island	Lehman (1938)
1936	Alafia Banks: 2,000 pairs of gulls nested on Bird Island	Lehman (1938)
	Gadsden Point: 250 pairs of gulls nested	Lehman (1938)
1937	Alafia Banks: 2,300 pairs of gulls nested on Bird Island	Lehman (1938)
	Gadsden Point: no Laughing Gulls observed	Lehman (1938)
1938	Alafia Banks: 1,800 pairs of gulls nested on Bird Island	Lehman (1938)
1939	Alafia Banks: 2,000 pairs of gulls nested on Bird Island	Mills (1939)
1949	Passage Key: 1,000 pairs of gulls nested	Mills (1949)
1963	Pass-A-Grille: Laughing Gulls nested on Shell Key	G. E. Woolfenden[1]
	Howard Frankland Bridge Causeway: 700-800 pairs nested on the west end	S. A. Rohwer
1964	Pass-A-Grille: 2,500 pairs nested on Shell Key	G. E. Woolfenden
1966	Passage Key: 25 Laughing Gull nests with fresh eggs	G. E. Woolfenden

TABLE 1. (Continued)

Year	Site name: estimate of population size	Source
1969	Bayway: 1,000-1,500 pairs nested	B. A. Harrington
1970	Bayway: Laughing Gulls nested, no estimate	Dinsmore and Schreiber (1974)
1971	Bayway: "Approximately 2,000 Laughing Gulls" present on 5 July	Ogden (1971)
1972	Bayway: 15,000 pairs nested	Dinsmore and Schreiber (1974)
1973	Bayway: 15,000 pairs nested	Dinsmore and Schreiber (1974)
1974	Bayway: 15,000-20,000 pairs of gulls nested	Schreiber and Schreiber (1978)
	Island I-61 colonized by Laughing Gulls	Lewis and Dunstan (1975)
1975-1976	Bayway: 15,000-20,000 pairs of gulls nested	Schreiber and Schreiber (1978)
1977	Bayway: 50,000 adults nesting Port Manatee Spoil: 7,800 adults nesting Island I-61: 800 pairs nesting Alafia Banks: 34 adults nested on Sunken Island	Schreiber and Schreiber (1978)

[1]References without dates are personal communications.

in 1934 (Lehman 1938). Nesting at this site continued throughout the 1930's until 1939 (Mills 1939). A storm that year washed out the colony.

Another dredged-fill site was colonized by Laughing Gulls during 1921-1940. A spoil bank off Gadsden Point supported a small colony of 250 pairs of Laughing Gulls in 1936 (Mills 1937). That was the first year that the site was vegetated (Mills 1937). Nesting was not reported off Gadsden Point in subsequent years by Lehman (1938, 1939).

During the 1940's and 1950's, Passage Key was to our knowledge the only Laughing Gull colony reported. Mills (1949) observed 1,000 nesting pairs there in 1949. Aerial photographs (Lewis and Dunstan 1975) of Bird and Sunken islands taken in 1948 show that Sunken Island had completely eroded and that nesting space on Bird Island had been substantially reduced by vegetative growth. This suggests that the natural sites at Passage Key and the Pass-A-Grille islands were the only potential nesting locations in Tampa Bay.

Records of Laughing Gull nesting are relatively abundant from the period 1961-1980. We have records of Laughing Gulls nesting at Pass-A-Grille in 1963 (G. E. Woolfenden pers. comm.) and in

1964 (Woolfenden and S. A. Rohwer pers. comm.), and at Passage Key in 1966 (Woolfenden pers. comm.). The west end of the Howard Frankland Bridge was used by gulls once in 1963 (Rohwer pers. comm.). Bayway fill was under construction by 1960 (Lewis and Lewis 1978) and consisted of several islands and a causeway. Laughing Gulls nested at several locations on the fill. We report a single estimate of population size for the Bayway sites. Our first record of Laughing Gulls nesting at this site was in 1969 (B. A. Harrington pers. comm.). During the 1970's, the number of gulls nesting on Bayway fill more than doubled although the exact colony sites changed when some of the islands were developed.

Additional spoil islands in the Bay Area were colonized by Laughing Gulls in the 1970's. Island I-61 was created in 1965 and colonized by gulls in 1974 (Lewis and Dunstan 1975). Nesting at this site was reported again in 1977 (Schreiber and Schreiber 1978). By 1981, this island had completely eroded away. In 1977, the rebuilt Alafia Banks site (Sunken Island) was colonized by 17 pairs of Laughing Gulls (Schreiber and Schreiber 1978), and the size of this colony grew each year for the duration of the decade. Port Manatee Spoil was created in 1969, supported a colony of gulls in 1977 (Schreiber and Schreiber 1978), and continued to be active through 1982.

Two new sites were found in 1981 and 1982 (Table 2). Fantasy Island was created in 1977 and was colonized by gulls shortly thereafter. North Spoil is a large dredged-fill island that supported colonies of Gull-billed Terns (*Gelochelidon nilotica*), Least Terns (*Sterna antillarum*), and Black Skimmers in 1981 (pers. obs.). In 1982 the island was colonized by Laughing Gulls.

Our current estimate of the Laughing Gull breeding population in Tampa Bay is 50,000 pairs. The Bayway colony site, once the largest in the state (Patton in prep.), apparently reached its maximum size in 1981, and by 1983 vegetative cover was reducing the habitat available for nesting. The 50% reduction in colony size observed at Bayway from 1981 to 1982 (see Table 2) is attributable to an abandonment of a substantial proportion of this site prior to egg-laying. The cause of abandonment is unknown. We do not know if these gulls abandoned the Bayway to breed elsewhere in 1982, but they departed sufficiently early that this is possible. Increases in colony sizes at Passage Key, Fantasy Island, and the new North Spoil site nearly equalled the reduction in colony size observed at Bayway in 1982 (Table 2).

TABLE 2. Estimated number of pairs of Laughing Gulls nesting at all active Tampa Bay colony sites in 1981 and 1982.

Colony Site Name	1981	1982
Passage Key	1,000	6,300
Port Manatee Spoil	5,000	4,200
Alafia Banks	7,300	4,550
Fantasy Island	6,000	15,300
North Spoil	unoccupied	3,800
Bayway	31,000	14,550
Total	50,300	48,700

DISCUSSION

The population of Laughing Gulls nesting in Tampa Bay has varied markedly over the past century. Prior to the 1880's, natural islands such as Passage Key and sites near Pass-A-Grille supported "countless hosts of Gulls, Terns, and Black Skimmers" (Scott 1888). Scott (1888) observed that by 1888, Laughing Gulls had been essentially extirpated as a nesting species from the Bay Area by plume and egg hunters. During the next 20 years, thanks to protective measures enacted by the Federal Government and the activities of the National Audubon Society, the Laughing Gull population experienced a period of limited growth. Creation of spoil islands, particularly the Alafia Banks sites, provided additional nesting habitat for Bay Area gulls. Extrapolating from the data in Table 1, we estimate that the maximum number of nesting pairs in any year (1935) approached 10,000 during 1921-1970. Three major colony sites were used: Passage Key, Pass-A-Grille, and Alafia Banks spoil. The sporadic accounts in the literature may result in an underestimation of the Bay Area gull population during this period. We believe however that until the late 1960's, the Bay Area gull population was limited primarily by the availability of suitable nesting habitat.

In the 1960's and early 1970's nesting habitat for Laughing Gulls increased substantially as a result of the creation of four new islands (Bayway, Port Manatee, Fantasy Island, and North Spoil) and the reconstruction of a fifth site (Alafia Banks). In 1982, six of the seven sites occupied by Laughing Gulls in Tampa Bay were artifacts. These sites supported 87% of the Laughing Gull population. Clearly, such sites are important to the expanded population. Bayway was bulldozed for preparation of housing lots following the 1983 nesting season.

Concomittant with this increase in nesting sites was an increase in food availability resulting from man's handling of refuse. Up to three major landfills in the Tampa Bay area were used regularly by large numbers of gulls throughout the summer. Our observations and those of Dinsmore and Schreiber (1974) of regurgitations to chicks at the Bayway colony indicate that a substantial proportion of food was obtained at landfills. Closure of the two Pinellas County landfills to raw waste in 1983 probably will adversely affect the Bay Area Laughing Gull population.

Summary

We summarize the history of nesting Laughing Gulls in Tampa Bay, Florida from the 1880's to the present. Laughing Gulls were abundant summer residents in the Bay Area prior to the millinery trade on at least two natural islands near the mouth of Tampa Bay. By 1888, Laughing Gulls were nearly extirpated as a nesting species from Tampa Bay. After protective measures, the Laughing Gull population recovered slowly and by 1935 more than 9,000 pairs nested at three sites. Creation of dredged-fill islands during the 1960's and 1970's greatly increased the available nesting area for gulls. This in combination with landfills as a supplemental food resource resulted in the rapid growth of the Bay Area Laughing Gull population. In 1982, approximately 50,000 pairs of gulls nested at six Bay Area colony sites.

Acknowledgements

We thank Richard T. Paul and the National Audubon Society for their assistance in some of the colony censuses. The field notes of Brian A. Herrington, Sievert A. Rohwer, and Glen E. Woolfenden provided important observations. Our studies of Laughing Gulls in the Bay Area have benefitted from discussions with Elizabeth and Ralph Schreiber. G. Thomas Bancroft, J. Steven Godley, Wayne Hoffman, Richard T. Paul, Glen E. Woolfenden, and two anonymous reviewers commented on earlier drafts of this manuscript.

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NOTES

Above-ground nests of the nine-banded armadillo in Florida.—Accounts of the nesting habits of the nine-banded armadillo (*Dasypus novemcinctus*) in North America (Louisiana and Texas) state that the nests consisting of masses of dry vegetation are placed in burrows or, more rarely, in natural caves or crevices in rocks (Clark 1951, Fitch et al. 1952, Kalmbach 1943, Lehman 1934 cited in Kalmbach 1943, Taber 1945). This report documents use of above-ground nests by armadillos in Florida. Although armadillos have been reported to build exposed nests of straw or dry grasses on the floor of indoor laboratory quarters (Anderson and Benirschke 1966, Johansen 1961) and on the ground surface in an outdoor enclosure (Moore 1968), such nests apparently have not been previously found in the wild.

In the period 1975-80 we observed about 100 above-ground nests on the Lykes Brothers ranch near Brighton and Palmdale, Glades County. Most were in native prairie or improved pastures with frequent saw palmettos (*Serenoa repens*), occasional shrubs, and scattered cabbage palm (*Sabal palmetto*)—live oak (*Quercus virginiana*) hammocks. Several were seen in slash pine (*Pinus elliottii*) flatwoods with dense palmetto understory. We also saw three nests in a cabbage palm-live oak hammock adjacent to prairie habitat at Lake Kissimmee State Park, Polk County, in February 1981. David Austin of the Florida Game and Fresh Water Fish Commission informed us that he frequently observed armadillo surface nests in open slash pine flatwoods containing abundant palmettos on the U.S. Air Force Avon Park Bombing Range in Polk and Highlands counties, and P. J. Cone and C. E. Winegarner reported (pers. comm.) seeing several such nests in cabbage palm-live oak hammocks in Myakka River State Park, Sarasota County, in March 1977. G. Galbreath (pers. comm.) also observed occasional above-ground nests in slash pine-turkey oak (*O. laevis*) woodlands on the Archbold Biological Station, Highlands County, in 1976-78. With the exception of the last locality, sites in which above-ground nests have been found are characterized by relatively poorly-drained soils and become wet or actually flooded during periods of high rainfall.

Most above-ground nests we have observed or had reported to us were built in clumps of saw palmetto, although nests are sometimes located in the open in prairie or improved pastures with high, dense grass. At one such site in Glades County, the density of nests was about 2/ha, with a minimum distance between nests of approximately 9 m.

The nests typically consist of a shallow depression, or form, roofed over with a heap of dry plant material. Nests in the open resemble miniature hay stacks. The depression is roughly pear-shaped from above and is deepest at the expanded end where the animal rests. The restricted end has a slanting floor leading to the nest entrance at ground level. Ridges of spoil resulting from excavation of the form are usually found at the rear edge or, rarely, along one side. Average measurements (ranges in parentheses) of 10 forms were: maximum depth, 22 cm (range = 15-30), maximum width, 24 cm (20-30), length, 34 cm (30-46). The outer portion of the nest mound tends to be more compact and composed of larger plant fragments than the interior. There was no obvious nest chamber, the central region of the mound (approximately 25 cm in diameter) being loosely filled with finer plant material.

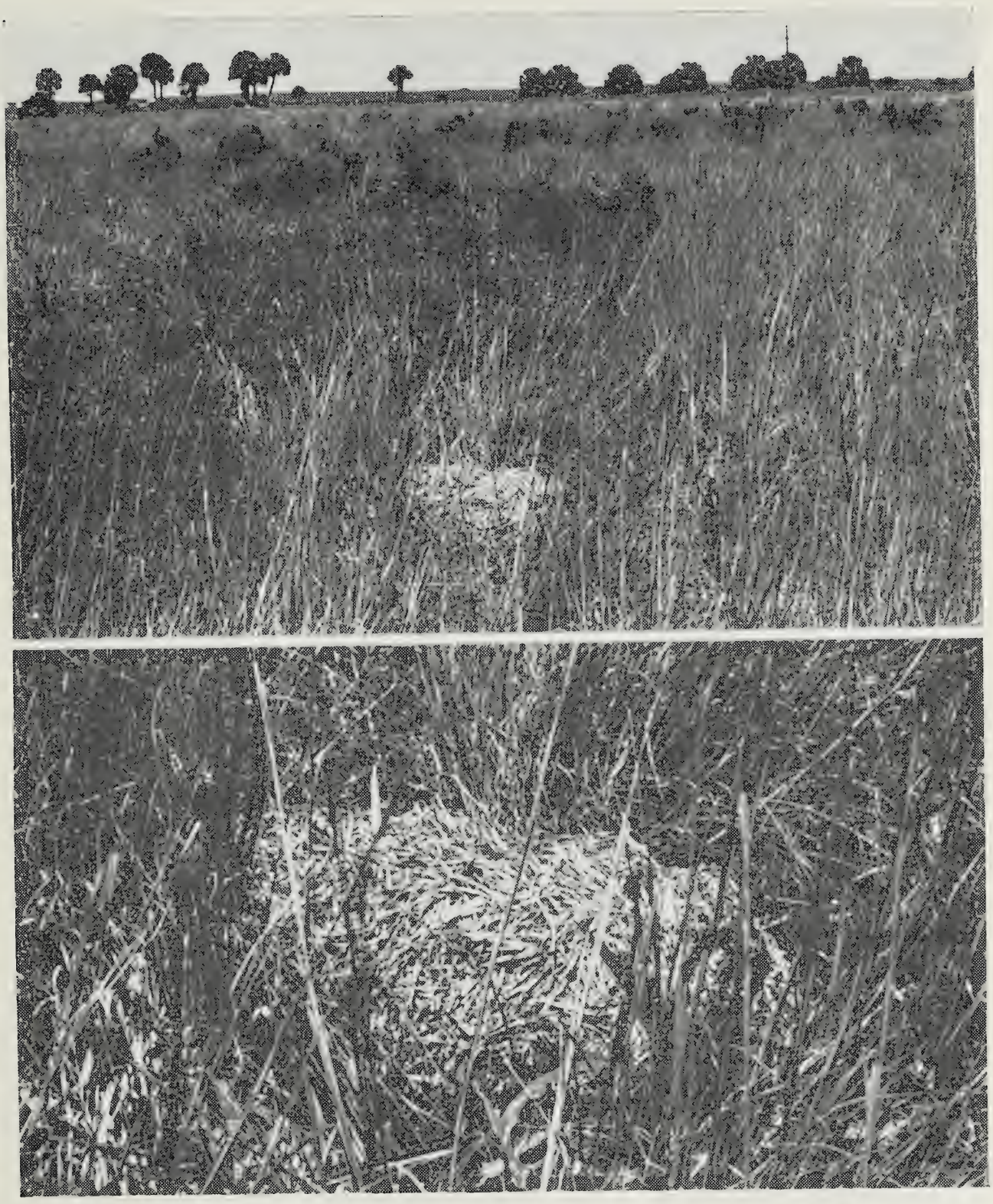

Fig. 1. Nine-banded armadillo surface nest in grassland habitat near Brighton, Glades County, Florida. Upper, general view; lower, detail of nest.

There is usually a single entrance 13-15 cm in diameter, which is loosely plugged with nest material and not readily apparent. Occasionally a nest had two or three entrances, but in such instances one entrance appeared to be used more frequently than the others.

The size, shape, and composition of the nest mound varied with site and type of nest material available. The largest nests we observed were built in the open in dense tall grass prairie (Fig. 1) and consisted of dried grasses (*Andropogon* sp., *Paspalum longipilum*). They were usually roughly circular or broadly oval in outline. Means and ranges (in parentheses) of the dimensions

of 5 examples were: maximum height of mound, 49 cm (41-61), maximum diameter, 101 cm (84-122), minimum diameter, 71 cm (43-99). All of the nests were built in association with tussocks of broom sedge (*Andropogon* sp.) with the form having been dug alongside or through the base of the clump. Nests located in saw palmetto thickets were not as large as those in open grassland. Means and ranges of four randomly selected examples were: maximum height, 31 cm (25-36); maximum diameter, 66 cm (46-86); minimum diameter, 48 cm (43-53). They were composed of dried pine needles, Spanish moss (*Tillandsia usneoides*), oak leaves, dry grasses, and fragments of palmetto fronds, the actual composition depending upon the abundance of different materials in the vicinity of the nest. The form was usually dug alongside a palmetto stem running along the ground or between two stems, with the mound heaped over the stems.

About one-fourth of the surface nests we observed were occupied. Most of the active nests were recorded during winter and spring. Except for one containing three adults and another with an adult female and three half-grown young, all nests had a single occupant.

Our observations indicate that above-ground nesting by armadillos is relatively frequent and widespread in central Florida. The location of most of such nests in poorly-drained sites suggests they are usually constructed in response to wet conditions when high water tables prevent use of burrows. In these habitats, clumps of palmettos, which are the preferred nest sites, offer a more elevated, drier site than the surrounding areas. Pacheco and Naranjo (1978) reported that a related species, *Dasypus sabanicola,* constructs surface nests during times of high water in flood savanna habitat in Venezuela.

It is noteworthy that above-ground nesting of the nine-banded armadillo has not been reported in other parts of the range where it has been extensively studied. This may indicate either that this habit is more prevalent in Florida habitats or that in other regions above-ground nests are in more inaccessible sites and thus have been overlooked.

Acknowledgments.—We thank David Austin, Peter J. Cone, Gary J. Galbreath, and Chester E. Winegarner for providing information on surface nests and David W. Hall for identification of plant specimens.

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Florida Field Naturalist 12: 58-61, 1984.

Identification of Arctic Loons in winter plumage.—Only two records of the Arctic Loon in Florida had been published (Kittleson 1976), by 1974, so on 18 and 19 February, 1974 observers rushed to Melbourne, Florida, to see a bird reported to be an Arctic Loon (*Gavia arctica*). Because this small loon had a short bill and a pale head, hind neck and back and because the head appeared rounded, many observers considered identifying this bird as an Arctic Loon. However, Harold Axtell (pers. comm.) of Ontario, Canada, wrote nine single-spaced, instructive pages of convincing details on why he considered this bird to be a small Common Loon (*Gavia immer*) rather than an Arctic Loon. Axtell's letter created the feeling among some observers that identifying an Arctic Loon by sight in Florida was a difficult endeavor, but after my experiences and the recent discoveries of field marks, I have concluded that Arctic Loons in winter plumage can be identified by sight in the field.

This observation presented an opportunity to evaluate available field guides. Using one Arctic Loon observation, without considering possible variations in plumages of other Arctic Loons, I compared the main field characteristics to the relative information presented in four 1983 field guides: Robbins et al. (1983), National Geographic Society (1983), the Audubon Society master guide to birding (Wahl 1983), and Harrison (1983), which I will refer to as Robbins, Geographic, Wahl, and Harrison, respectively. My grading system was as follows: if the text presented the entire field mark in a thorough manner, I graded it a 10; in a useful manner, but with minor omissions, a 9; in an adequate manner, but with some serious omissions, an 8; in a poor manner with some field marks ambiguous or inaccurate or no field marks in the text, but the field mark illustrated well, a 5; or omitted the field mark, a 0. The grades for each field mark were averaged for each guide to determine the effectiveness of each in identifying this individual bird.

On 26 December 1983 on the Jacksonville, Florida, Christmas Bird Count John Hintermister and I had the fortuitous opportunity to observe the loon continuously through telescopes for over an hour from less than 30 m away. In the calm huge tidal pool west of Ward's Bank, this resting bird floated in front of us, turning slowly on the water. Occasionally, the loon raised its head as we watched it. Although other observers saw this bird on 26 and 27 December, our sighting was so lengthy and so close that we had the opportunity to make detailed notes at leisure (Fig. 1).

Bill. The bill on our loon was straight, gray, thinner and shorter than a Common Loon's bill with no sharp angle on the lower mandible. Robbins stated,

"The bill is thinner than Common's and straight." No mention was made of bill color—8. Geographic reported that the ". . . bill is slim and straight," but omitted its color—8. Wahl wrote, "The slender darkish bill is normally held horizontally."—9. Harrison wrote that the bill was gray with the culmen blackish and also the tip in first winter birds. The bill was ". . . more slender . . ." than the Common Loon and a ". . . straighter, dagger-like bill . . ." than the Red-throated Loon (*Gavia stellata*)—9.

Head color. The head and crown on our loon was a striking brown in color, forming a cap running from the base of the bill well below the eye straight back to the rear of the auricular patch. There was no white around the eye except for a very light distinct stripe that started at the bottom of the eye and continued downward to the edge of the cap. Robbins did not describe the head—0. Geographic described the dark cap as extending to the eye, did not remark on the absence of white around the eye, but did mention the white around the eye of a Common Loon—9. Wahl described the dark cap extending cleanly below the eye, but did not mention the absence of white around the eye—8. Harrison described the dark brown shading to grayish brown on the crown and on the sides of the face but did not include the absence of white around the eye nor say how far down the side of the face the cap extended. Harrison also mentioned the white around the eye of a Common Loon and was the only guide to report the gray on the head of the juvenile and the brown on the head of an adult in winter plumage—9.

Chin. On our loon a narrow dark line ran under the cap between the white chin and throat to form a distinct well-marked chin strap. Robbins and Geographic both presented the chin strap—10. Wahl and Harrison omitted this mark—0.

Cheek. Our loon showed a white cheek area with the grayish brown forming a curved pattern partly around the rear of the auricular patch. Robbins did not mention nor show this point—0. Geographic pictured this white curved area—5. Wahl described a ". . . white cheek area below and behind the eye"—10. Harrison pictured this white curved area—5.

Head shape. On our loon the shape of the head was rounded, completely unlike the angular shaped head of the Common Loon with its distinctive high forehead and flat top. Robbins mentioned no head shape—0. Geographic described the head as ". . . smoothly rounded"—10. Wahl incorrectly listed the forehead as steep, but under Common Loon stated that the Arctic Loon had a ". . . more sloping profile than the Common."—5. Harrison mentioned nothing about head shape, but illustrated the foreheads as steep in the winter plumage and sloping in the breeding plumage.—0.

Body color. Our loon had a white chin, throat, neck and breast. A black streak ran down the center of the neck bordering a gray hindneck and a white foreneck to form a "three-toned" neck. Geographic was the only guide to describe the "three-toned" neck—10. The other guides ignored this mark—0.

Back. On our loon the unmarked back, with a few light gray feathered edgings barely visible, was a very dark gray on the front part of the back and a lighter gray on the remainder forming a contrast between the lighter head and neck and the darker back. Robbins stated, "The back is darkest of all loons with pale feather edgings," and under Common Loon, "In winter the head, neck, and back . . ." show ". . . less contrast than in Arctic"—9. Geo-

graphic wrote, ". . . winter birds crown and nape are paler than back"—9. Wahl stated, "The back appears very dark and uniformly colored." There was no mention of contrast between neck and back—8. Harrison wrote, "Upperparts mostly dark brown, with indistinct white subterminal spots on scapulars; appears blackish above at distance or in poor light" and ". . . crown and hindneck paler than blackish back"—10.

Flank. On our loon the rear flank area from the left side was a light gray and contrasted with the darker gray around it and had two very small white patches showing on this light gray patch. The rear flank area on the right side was a dirty white. Under the crossed primaries from the rear, we could see black undertail coverts forming a black stripe and running to the waterline and with white patches on both flanks. Robbins, Geographic, and Wahl did not mention this field mark—0. Harrison was the only guide to describe this "whitish flank patch—10. (Dennis 1978, Fitzpatrick 1978, and Jackson 1978). This whitish flank patch on an Arctic Loon was drawn in field sketches by Robert Crawford (pers. comm.) on 15 December 1979 during a St. Marks Christmas Bird Count.

Conclusions. In aiding in the identification of this individual specimen, Geographic scored highest by far with 61 points out of a possible 80 with two excellent points: the chin strap and the "three-toned neck", the only guide to present this latter field mark. Harrison placed second with 43 points and scooped the field with the white flank patch and the brown cap on the wintering adult. Wahl scored third with 40 points. Robbins scored lowest with 27 points, but this guide mentioned the important chin strap and warned the observer about small Common Loons as did Geographic. Geographic surpassed the other field guides by a considerable margin; however, the serious student will want all the guides to assure the inclusion of current field marks.

I thank the following people for their help in producing this paper: Wayne Hoffman, Gloria Hunter, Dr. James Kushlan, Fred Lohrer, Paul Sykes, and Tadziu Trotsky.

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SPECIAL REVIEWS—NEW FIELD GUIDES

Birds of North America, a guide to field identification, expanded, revised edition.—Chandler S. Robbins, Bertel Bruun, and Herbert S. Zim. Illustrated by Arthur Singer. 1983. New York, Golden Press, Western Publishing Co., Inc., 360 pp. 170 color plates, 632 range maps. $10.95 hardcover, $7.95 softcover.

Field guide to the birds of North America.—National Geographic Society Book Service, Jon L. Dunn, and Eirik A. T. Bloom, Chief Consultants; George E. Watson, General Consultant; John P. O'Neill, Consultant for Songbirds. Illustrated by H. Douglass Pratt, Diane Pierce, Donald L. Malick, and 10 additional artists. 1983. Washington, D. C., National Geographic Society. 464 pp., 220 color plates, 533 range maps. Available from the National Geographic Society, Dept. 100, Washington, D. C. 20036, for $13.95 softcover, plus $3.00 postage & handling.

In 1934 Roger Tory Peterson's A field guide to the birds of eastern North America first brought birders into the modern era with concise and simple field identification techniques in an inexpensive, pocket-sized book. Peterson's field guides had virtually no competition until 1966 when Birds of North America by Chandler S. Robbins, et al. was first published. Now, hot on the heels of Peterson's fourth edition (1980, reviewed in Fla. Field Nat. 9: 43-48, 1981) we have Robbins' "expanded, revised edition" and a new entry in the race for the birders' field-guide dollars, the National Geographic Society's Field guide to the birds of North America. Both of these outstanding books are the subject of this special review.

The new Robbins has a stronger binding, 20 more pages, and 12 more plates than the original edition and has been completely reset in a modern roman type style. The 632 range maps have all been redrawn and revised but the plates will look very familiar with 128 retained essentially unchanged from the original edition.

Robbins includes 650 species that nest in North America north of Mexico (including Greenland), 60 regular vagrants, and about 100 accidentals, versus 645, 30, and about 25, respectively, in the first edition. The scientific names follow the new AOU Check-list of North American birds, sixth edition, but the common names are those of the 1982 American Birding Association list. Although the contents are listed in AOU order (to family and even subfamily for the passerines), this sequence is not always followed in the book. Unlike Peterson's fourth edition, Robbins includes the vagrants and accidentals in taxonomic order so one can find, for example, 4 species of godwits illustrated on one page—certainly a distinct advantage if you think you might have one of the vagrant species in view.

The major face-lift of the revised edition concerns the range maps. Although still postage-stamp size, North America is now white against a grey background which shows the familiar pink, purple, and blue ranges and migration corridors to better advantage. Also the scale of some maps has been expanded to show the distribution of restricted species in better detail (i.e. unstreaked thrashers, p. 242). This useful technique should have been used more often. Overall though, these maps are one of the best features of the book and will repay careful study, either by comparison with maps in the first edition for examples of range expansion (Brewer's Blackbird, p. 298; Brown-headed Cowbird, p. 300), or for depicting patterns of disjunct breeding ranges

(Northern Parula, p. 276; Pine Warbler, p. 286; Prairie Warbler, p. 286), or for showing migration corridors that explain relative species occurrence in Florida (compare Mourning and Connecticut warblers, p. 290).

Many of the new species illustrated in the revised edition are either Asian species that occur in western Alaska or the Aleutians, or exotics, or strays from Europe and the Neotropics. The 5 new plates include Alaskan peep (7 spp.), parrots (10 spp.), stragglers to Florida or Alaska (grassquits and finches, 7 spp.), and immature terns (2 plates, 14 spp.), and 4 plates are almost all new (robin-like thrushes, large dark- or gray-mantled gulls, and shearwaters). I judged 7 plates to be half new and 26 plates only slightly new with one bird added or deleted. Much of the introductory material has been rewritten, and includes an excellent discussion of sonograms. Robbins' new edition is by almost all measures an improved one and still is a fine little book to use in the field or to give as a gift.

At first glance the National Geographic guide looks very similar to Robbins, except being slightly larger and 75% heavier. However, the production and some of the details of the book are quite different. The staff for this book includes an editor, associate editor, 2 assistant editors, 8 writers, and 8 researchers, who evidently prepared the book in consultation with two of America's foremost birders, Dunn and Bloom, and with two leading ornithologists, Watson and O'Neill. Bloom compiled the range maps, and 13 artists painted the plates. Quite a flock!

The pages are about 20% larger and there are 104 more than those in Robbins. Fewer species are illustrated on each plate leaving more space on the facing page for each species account. However, some of the species accounts are too long for easy reference in the field. Subheadings would be a great improvement. Compare several NG species accounts with those in Robbins to gain an appreciation for the concise prose of the latter. The NG introductory matter is strong on aspects of birding especially nomenclature, plumage and molt, and birding equipment. However, the introduction and family headings scattered through the text are weak on taxonomy and natural history when compared with Robbins. Unfortunately, with the larger pages the NG range maps are not bigger than those in Robbins, because with state and provincial boundaries included on the base map the yellow, green, and blue ranges (for breeding, permanent, and winter, respectively) are not always as distinct as the colors in Robbins. Yellow alone is especially difficult to see on some maps. Unlike Robbins, the NG guide adheres to both common and scientific names of the AOU Check-list, sixth ed., but like Robbins, the NG guide departs occasionally from AOU sequence.

The list of 13 artists (p. 464) includes the plates they did, with the breakdown generally coinciding with taxonomic boundaries. Three artists did 51% of the plates; Pratt (58 plates), Pierce (34), and Malick (23). Some artists did only 1 or 2 plates. These feather-perfect pictures and the outstanding color printing make this book a showcase of bird art. The plates, as in Robbins, show birds (794 species by my count) in typical habitat with some preening, stretching, displaying, or holding food. The NG plates are busy with many individual figures, and often show different age classes or both sexes. It is a treat to see the different races depicted for so many sparrows. But on many of the plates, especially the passerines, it is difficult to find the bird because of all the foliage and because there is an overall lack of symmetry on the plates—all the birds do not face the same way.

The NG guide is a fine book that will no doubt find its way into many public libraries across the country through the National Geographic distribution network. But its utility as a *field* guide is diminished because of the busy plates and large blocks of text.

For this multiple review we have assembled an outstanding team to evaluate these books from distinctive perspectives. Wayne Hoffman, whose birding experience spans the continent from the Aleutians to the Dry Tortugas, is a Ph.D. candidate in ornithology at the University of South Florida. Howard Langridge is one of Florida's most dedicated birders and envied by all for his uncanny ability to find West Indian strays in southeastern Florida. David Maehr, an outstanding wildlife artist, is a game biologist for the Florida Game and Fresh Water Fish Commission studying birds and mammals.—**Fred E. Lohrer,** Archbold Biological Station, Rt. 2, Box 180, Lake Placid, Florida 33852.

Florida Field Naturalist 12: 64-66, 1984.

Two field guides.—I will limit myself in this review to a series of questions about the use of these field guides in the field. Which guide would be more useful for birding along the Mexican border? Or in Alaska? Which guide is more useful for a beginning birder? Which guide is more useful for advanced birders? How do the two guides perform in dealing with the difficult species-groups, such as gulls, shorebirds, fall warblers, and grassland sparrows? (*Empidonax* flycatchers are left out of this list because I do not know them well enough.)

Both are intended as guides to the birds of the whole of North America north of Mexico, so naturally they include mostly the same birds. They differ substantially, however, in their coverage of introduced birds and of accidentals. Robbins includes a plate of 10 introduced parrots and parakeets; NG illustrates only 6 of these. On the other hand, NG illustrates more exotic waterfowl (Egyptian Goose, oddly, is omitted). Robbins' plate of introduced Galliformes includes Chuckar, Gray Partridge, Ring-necked Pheasant, and Black Francolin; NG shows all of these and Japanese Quail, Red-legged Partridge, Green Pheasant, and Himalayan Snowcock(!) as well. NG includes the Hill Myna and Java Sparrow, but Robbins retains the European Goldfinch.

NG includes far more accidentals but omits several illustrated by Robbins. Robbins includes one more shorebird (Marsh Sandpiper) but NG illustrates 6 additional seabirds (Short-tailed Albatross, 1 shearwater, 1 petrel, 2 storm-petrels, Red-tailed Tropicbird). NG illustrates 7 more Caribbean strays (3 doves, Bahama Woodstar, Loggerhead Kingbird, Bahama Mockingbird, Thick-billed Vireo) but Robbins includes that reknowned Marielito, the Melodious Grassquit. Similarly, NG illustrates 10 more Mexican specialties (Jabiru, Collared Swift, Yellow Grosbeak, and Rufous-capped Warbler are highlights) and 17 more Asian strays (including among others, Steller's Sea Eagle, Siberian Accentor, 5 buntings, and 2 warblers) but you must go to Robbins for an illustration of a Brown Tree Pipit. Robbins also includes three species (Redwing, Meadow Pipit, Eurasian Blackbird) on the basis of Greenland records. Thus, in general, NG would be more useful in the Aleutians and along the Mexican border, but a serious birder would want to have both along.

I have been comparing both books in the field for a couple of months. Several opportunities arose during a winter trip to California to compare the guides against interesting birds. The illustration in Robbins of a pale-phase Rough-legged Hawk was superior because it shows clearly the contrast of pale head and breast to darker body that is so apparent in the field. In the NG illustration the head streaking is over-emphasized, obscuring the head-body contrast. Robbins also provides better illustrations of Band-tailed Pigeon and Townsend's Warbler, and the shapes of scoters are more realistic. This last point may seem trivial, but many of Florida's most prominent birders will remember arguing over the identity of a strange duck (Surf Scoter) silhouetted against the light at Merritt Island during a recent FOS meeting. The shapes of scoters are distinctive and often useful in identification. The NG illustrations were more useful in picking a female Lawrence's Goldfinch from a flock of Lesser Goldfinches, and averted confusion over chickadee identities by illustrating the dull-sided California form of Chestnut-backed Chickadee as well as the chestnut-sided ones I used to feed in Oregon. The NG treatment of immature Black-shouldered Kites seemed more accurate, although both guides are quite adequate for identification. Neither guide has adequate illustrations of the dark-phase Red-tailed Hawks so common in the West. Neither accurately portrays the head color of female goldeneyes, but NG comes a little closer. Both guides' illustrations of the Black Phoebe are suitable for identification, but Robbins' comes closer to capturing the essence of the bird. The NG illustration gives the impression of a smaller bird.

I also had opportunities to compare the guides during a brief visit to Newfoundland in February. NG captured better the gestalt of Iceland and Black-headed gulls, and also illustrated more plumages. NG also provides a more realistic illustration of the Black Guillemot's winter plumage. The illustrations of winter-plumage Ruffs in NG more closely matched the appearance of one that roosted with Rock Doves on the fourth floor window ledge of Memorial University's Science Building! In particular, the distribution of white on the rump is shown more accurately in NG. Robbins includes better illustrations of Red Crossbills, Pine Grosbeaks, and Boreal Chickadees. The various "red finches" in NG are not well done. The Pine Grosbeaks fail to convey that bird's size, and the crossbills have exaggerated, or misshapen bills. The two guides' illustrations of Boreal Chickadees are very different. Birds I saw showed chestnut flanks and dark caps as in Robbins, and were quite unlike NG's washed-out rendition.

I will deal now with some specific groups of birds. For gulls and terns I prefer the treatment in NG. Shapes, slopes of foreheads, and proportions generally are better, and I appreciate the additional subadult and winter plumages. The new plates in Robbins of dark gulls and of immature terns appear hastily painted and are poorly reproduced. Tail shapes are distorted on several of the young terns.

I prefer the treatment in Robbins of many of the shorebirds. In NG, the plates of curlews and godwits are almost comical in their distortions of leg lengths, bill shapes, head sizes, and even overall body sizes. Robbins' Marbled Godwit comes closer to the tawny color so distinctive in these birds. The tattlers, snipe, and phalaropes in NG also seem badly proportioned. On the other hand, the shorebird flight pictures in NG are very useful.

I also prefer Robbins for coverage of most of the warblers. The NG illustrations of Pine Warblers do not convey the larger size and heavier bill so evident in the field. The Black-and-White Warblers in NG look somehow "wrong". To me, Black-and-White Warblers appear very sleek, not ruffled. The color of female and young Cerulean Warblers is not accurate in either guide. In Robbins it is too gray, and in NG far too green.

The coverage of sparrows is one of the strong points of NG. Although body shapes are less realistic than in Robbins, more plumages are shown, and for more than a third of the species two or more races are included. I compared the illustrations in both guides to sparrow specimens at USF and concluded that the NG guide should be more useful for at least 8 species, and Robbins for 3 species. For the rest, coverage was similar, or else I lack the experience (or specimens) to judge. I get a better impression of sizes from Robbins; the Harris' Sparrows and Golden-crowned Sparrows look big as they should, and in NG they do not. NG's illustrations often are more accurate in details of plumage. NG shows better the tawny lower flanks of Lincoln's Sparrows, the pallid appearance of American Tree Sparrows, and the gray back of interior Rufous-crowned Sparrows. NG's winter illustrations of Swamp and Chipping sparrows will be helpful in Florida (but what happened to the cap of the breeding plumage Chipping Sparrow?).

I would recommend the Robbins guide as preferable for beginning birders. It gives adequate coverage of the common and distinctive species, and has fewer misleading illustrations. The more detailed coverage of the NG guide will be most useful to birders who are working with the more complicated groups, such as gulls, terns, and sparrows, or who are searching particularly for accidentals.—**Wayne Hoffman**, Department of Biology, University of South Florida, Tampa, Florida 33620.

Florida Field Naturalist 12: 66-68, 1984.

Two field guides.—The reasons for the popularity of the 1966 edition of A guide to field identification: Birds of North America by Robbins, Bruun and Zim are the splendid illustrations, the helpful innovative features like the polychromatic range maps beside the text, and the plates with heads of warblers and sparrows; and the inclusion of most of the birds of North America in one volume. Robbins' revised edition (1983) is very similar to the original edition except for the impressive addition of 64 vagrant birds. In most instances, the new illustrations of bird stragglers are inserted among the existing pictures.

Some of these vagrants inserted are the Yellow-nosed Albatross, Bean Goose, White-cheeked Pintail, Falcated Teal, Garganey, and Black Francolin. Not all the newly added vagrants were frugally inserted onto the original plates. Plates of Alaskan peeps, robin-like thrushes, Florida and Alaska stragglers, pipits, and parrots are five of the nine new or heavily revised plates. The addition of these bird vagrants is the major strength of this revision.

Overall, the text has not been changed very much, with some pages unchanged. Thus the text does not include many of the new field marks established

in the last decade, such as the difference in the central rectrices of the Golden-fronted and Red-bellied woodpeckers, the difference in color of the eyes of the Long-billed and Brown thrashers, the double bump on the head of the Yellow-billed Loon, and the difference in the gray collar and other marks between the Clay-colored and Chipping sparrows (Birding, Oct. 1977).

The brief text could have been improved by the addition of important common field marks such as the white lines above and below the speculum of the Green-winged Teal, the all white undertail coverts of the Purple Gallinule, the slow flight of the Great Egret, the diagnostic swooping up to a perch by a flying Loggerhead Shrike, and the overlap in bill length of some Western and Semipalmated sandpipers.

There were even some errors in the illustrations and text of the original edition that were not changed. Although the wings of the Snail Kite were lengthened in the revision, the wings of the White-rumped Sandpiper still do not extend beyond the tail as they should. Although the culmen of the Groove-billed Ani was flattened somewhat (but not enough), the gonys was not. The length of the Groove-billed Ani is still incorrect; this bird is shorter and smaller than the Smooth-billed Ani. The green legs of the Common Moorhen are the same yellow color as the Purple Gallinule in the paintings. The light bands in the wings of the Band-rumped, Wilson's and Leach's storm-Petrels do not stand out prominently as illustrated. Robbins surely means *gliding* instead of *soaring* in his description of the flight of the Band-rumped Storm-Petrel.

Some improvements in the text were not matched by changes in the illustrations. For instance, Robbins mentions the Horned Grebe floating with its rump low and the Eared Grebe floating with its rump high, yet the paintings have not been changed to illustrate this point. The text adds that the Cory's Shearwater may have white upper tail coverts, but the illustration has not been altered to show this. Robbins adds that the Lesser Nighthawk is browner in color than the Common Nighthawk, yet the illustrations of the perched Common Nighthawk shows the reverse.

Two points create confusion. One, the use of common names from the ABA Checklist 2nd ed., 1982, instead of from the AOU Checklist, 6th ed., 1983, can only help to prolong the confusion created by these new name changes, particularly with the use of "Louisiana" and "Green" herons. Two, instead of using the standard method of measuring birds and taking the measurements from available literature so that all guides have uniform measurements, Robbins takes the measurements from bird banders who hold the bird in a life-like pose and measure it. This creates confusion if one consults more than one guide.

The polychromatic range maps are easily read and are placed handily beside the text, but they need a tremendous amount of work. Although the range in Florida of the Greater and Manx shearwaters and the Cliff Swallow are current, I found sixty-two errors pertaining to Florida in the range maps. Although some of these errors are extra-limital in nature, they still should have been marked according to the introduction. However, many of these errors are flagrant omissions, incorrect range extensions, and incorrect range abridgements. For example, the frequent presence of the Great Cormorant in winter in Florida is not indicated. The Great Black-backed Gull is regular in

winter in Florida, but the new edition shows the southern end of its winter range near Virginia. The occurrence of Semipalmated Sandpipers and Common Terns along the Florida and Gulf coasts in winter does not agree with authoritative sources. The Snowy Plover does not occur with any frequency at all on the lower east coast of Florida. The Lesser Yellowlegs and Solitary Sandpiper range maps are transposed. The Tufted Titmouse does not occur as far south in Florida as shown; whereas, the White-breasted Nuthatch occurs farther south. If the Black-throated Green and Yellow warblers are considered as wintering warblers in south Florida, so should the Worm-eating, Magnolia and Wilson's warblers. The Franklin's Gull, Brown-crested and Least flycatchers, Bell's Vireo, Clay-colored Sparrow and Lincoln's Sparrow are not shown as wintering in Florida. According to the range maps, the Philadelphia Vireo, Golden-winged, Tennessee, Nashville, Magnolia, and other warblers are not shown as occurring in Florida, even in migration.

Despite the absence of much current information on field marks and on Florida distribution of birds, this field guide will continue to be popular for some time because of its lifelike illustrations, its concise one handy-sized volume, and its low cost.

When Peterson's (1935, 1944, 1960) and Pough's (1946, 1951, 1957) field guides for North American birds became available, an observer needed three basic volumes and occasionally a Mexican, European, Asian or West Indies guide for bird wanderers. Then Robbins, Bruun and Zim (1966) admirably compressed it into one. Now, National Geographic (NG) with the Field guide to the birds of North America (1983) continues this consolidating trend by adding illustrations and text of many vagrants and introduced species, thus eliminating the need for a variety of foreign guides when one visits Alaska, Arizona, Texas, California or Florida. Forty-three vagrants are presented that are not illustrated in other popular field guides including Robbins' revision (1983) and the Audubon Society master guide to birding (1983). Illustrations of Stejneger's Petrel, Eared Trogon, Middendorff's Grasshopper-Warbler, Slate-throated Redstart, Blue Bunting, and many more will churn the avaricious juices of the reader. Instead of crowding the illustrations of many vagrants on one page, NG inserts them in reasonably proper taxonomic sequence, except for the raptors. So the guided tour devotee, the bird chaser, and other eternally optimistic birders should rush without delay to purchase this book if only because of its many colored plates of sporadic visitors.

At last, field guides are now available that utilize some of the information learned about field identification during the past decade. Both the NG guide and the Master Guide completely dominate the other all purpose popular field guides in this respect. Examples of some of the new marks are the Yellow-billed Loon has a "double bump" effect on the top of its head, skuas have a "hunch-backed" look, and the Long and Short-Dowitchers in juvenile plumage have different tertial fathers. Helpful features for observers in Florida include the description of the distinctive flight of the Black-capped Petrel which is evident at a considerable distance at sea and the description of call notes of eastern *Empidonax* flycatchers.

Despite the compression of the text by NG into one volume, it still competes well with the Master Guide's three volumes and occasionally scoops the field as in the following field marks: a white U on the rump of the Ruff; the difference in length of the legs of a flying Cattle Egret, Snowy Egret, and

Little Blue Heron; the absence of a pronounced hook on the bill of the Franklin's Gull; the three-toned neck of the Arctic Loon; the short outer primary feather of a Lesser Nighthawk; the difference in the tails of the Golden-fronted and Red-bellied woodpeckers.

Although the text is excellent, some omissions occur, especially concerning Florida birding. Many alarm notes of Florida wintering passerines, especially warblers, are left out as well as the tail cocking of the Hermit Thrush. The chestnut patch on the wing of a flying Virginia Rail and the short neck of the Sharp-shinned Hawk are not mentioned. A good field mark of the Limpkin that was omitted is the flicking of the primaries during flight. This book fails to mention the slow wing beats of the Great Egret as an easy field mark for separating this species from the other smaller white egrets and herons in flight. Field guides of the future should meet the needs of the observer by devoting more space to plumage, vocalization, and behavior of birds on their wintering grounds in the South.

In addition to omissions, there are a few questionable statements. The bright yellow orange legs of the Purple Gallinule is a sound field mark so when NG states that the Common Moorhen has yellow legs (it has green), this misinformation is particularly confusing. Interestingly, the assertion that the Bay-breasted Warbler is an earlier migrant than the Blackpoll Warbler is not substantiated by our local records on the lower east coast of Florida nor by Cunningham's "A field list of south Florida birds." The description of the Least Bittern call, ". . . a series of harsh *tut* notes," does not sound like its soft *coo* at all. The ruddy Quail-Dove is very rare on the Florida Keys, not casual. The *conspicuous* eye ring of the Alder Flycatcher was surely meant to be *inconspicuous*. Despite these and a few other faults, the expertise of the consultants and of the many other sharp field observers mentioned in the acknowledgements is evident in this outstanding field guide.

What makes the NG field guide distinctive is its abundant use of illustrations as a method of instruction. For example, a number of plumage variations are presented for many species: 113 species have three different plumages, 92 have four, 34 have five, 13 have six, and 2 have eight. Other effective instructional uses of the pictures are the numerous paintings of birds in flight, including separate pages of flying ducks, gulls, female hawks, and shorebirds. The latter is especially informative as it shows the difference in flight among the Bar-tailed, Hudsonian and Black-tailed godwits and between the Whimbrel and the Eskimo Curlew; the Ruff and the Pectoral Sandpiper; the Greater and Lesser golden-plovers; and others.

The quality of most of the illustrations is accurate and uniform despite the use of thirteen artists with varying degrees of competency and style. Although some pictured birds have thick necks, short necks, thick legs and plump bodies, one might attribute this to the artist's style. Unfortunately, there are a few flaws in some of the illustrations. By using the measurements from available sources and by comparing the length of the bill in relation to the length of the body, I determined through extrapolation that the bills of the Carolina Wren and Gray-cheeked and Swainson's thrushes were too short. The Little Blue Heron illustration shows the two immatures to have a yellow cere (it is dark) and some yellowish color in the bill (it is bluish gray or slate with a black tip). The feet of the Connecticut Warbler are astonishingly large.

Neither the text nor the illustrations indicate that the Summer Tanager has a longer and larger bill than the Scarlet Tanager. In all plumages the primaries extend 1 to 2 cm beyond the tail of the Snail Kite, so the wings are too short in the Snail Kite painting. In the dove plate, the Key West Quail-Dove and the Ruddy Quail-Dove are too small in size on the page in relation to the Common Ground-Dove. In addition, some of the illustrations do not follow the field marks presented in the text. For example, in the plate of the Purple Gallinule the greenish yellow legs should be a bright yellow or yellow orange as the text indicates. The picture of the winter Red-throated Loon does not follow the point in the text that the pale head and neck often blend into the white on the throat although the Red-throated Loon painting used as a comparison on the previous plate shows this point well. The illustration of the Cory's Shearwater does not show the white on the upper tail to form a white crescent as mentioned in the text. However, despite a few shortcomings, most of the plates are accurate and well executed.

The polychromatic range maps appear next to the text and are relatively easy to read, but they contain several errors. The maps did not indicate that the following species winter in Florida: scoters, Western Kingbird, Brown-crested and Least flycatchers, Northern Rough-winged Swallow and Northern Oriole. The White-breasted Nuthatch's range is farther south than shown and the Bewick's Wren and Henslow's Sparrow range is too far south (Stevenson 1960, A key to Florida Birds). The Red-throated Loon and Common Merganser are very rare in south Florida, not wintering there as shown. The Limpkin's range is poorly done. The entire area between Lake Okeechobee south to Everglades National Park with its many Limpkins is marked as having none. The Snowy Plover is inaccurately marked as occurring only in Florida on the coast of the Panhandle. So obviously much more care could have been taken on the range maps in Florida.

Despite a few inaccuracies in the illustrations and text and some inaccurate range maps, I recommend this book because of the inclusion of many bird vagrants, the many illustrations of plumage variations, the plates of birds in flight, the paintings comparing species, and many of the new field marks discovered in the past decade.—**Howard P. Langridge**, 1421 W. Ocean Ave., Lantana, Florida 33462.

Florida Field Naturalist 12: 68-72, 1984.

Two field guides.—Bird watchers of all descriptions await the arrival of new field guides with high expectations and anticipation. Usually a new guide or revised edition comes along every 5-10 years or so, and the time interval between new arrivals is long enough to polarize the birding public into advocates and critics of extant editions. Until now, birdwatchers have never had so much to expect, so much to criticize and so many books to choose from. The new guides featured in this review are just two of three totally new or revised guides of North American birds. Both are extremely thorough in their coverage of North American residents, migrants, exotics and accidentals. Similarly, each guide *generally* follows the latest AOU taxonomic sequence (my 1980 Peterson, 4th edition, has been a virtual desk copy because I cannot feel comfortable with the haphazard ordering of bird families).

Most of the similarities end here. The Robbins guide remains a practical field companion, easily stuffed into a pocket or pocketbook. National Geographic (NG) has opted for a more spacious treatment rendering most pockets useless for field storage. This difference may be enough to determine whether or not one purchases a new field guide. But if you're more than a pocket stuffing birder, both new guides deserve a closer look. At first glance, the NG guide is nearly overwhelming. The reproduction of original artwork is superb and it is a feast for the eyes. The number of artists used has resulted in a diversity of styles and adds a dimension to the guide that no other has matched. It was the obvious intent of NG to pigeonhole their artists into taxonomic specialities (certainly not to save time). However, if a particular artist demonstrated a real verve towards one taxon, this was not sufficient to predict a similar result with another bird group. For example, Janosick's three plover plates are technically accurate and attractive, yet his juvenile stilt has legs that are too long, and the oystercatchers and avocets appear rubber-legged; the result of indistinct shading and improper proportions. Similarly, his winter Common Loon sports a bill better suited to a woodpecker. To be sure, though, these inconsistencies do little, if any, to hinder field identification, and the artist by artist comments that follow are primarily based on aesthetics.

Marc Hanson's pelagic seabirds are technically perfect and are a pleasure to look at. His Limpkin is especially lifelike. An examination of his coots and moorhens, though, reveal oversize legs and feet, and the Purple Gallinules are buoyed on rather equatorial-looking lilies.

Cynthia House complements the NG guide with accurate and consistent waterfowl renderings. These plates, however, appear less "alive" than many in the guide; a possible result of more subdued colors and depictions of birds in rather stiff postures. House's whistling-ducks, though, seem to capture the essence of these birds which in most guides appear more duck-like than behavior, morphology and taxonomy would indicate (here's a good example of a questionable departure from the AOU sequence).

Donald Malick provides, perhaps, the most spectacular artwork in the NG guide. I continue to marvel at his tension-filled, wonderfully composed accipiter plate. The subtly different positioning of head, body and tail of each bird encourages the eye to scan the page in a circular motion; it's easy to become captivated. The food habits of these birds are also quite apparent (maybe too apparent for some), and adds an additional natural history dimension to the plate. Similar high marks are due for Malick's owls and woodpeckers. And, while I'm not partial towards Piciformes, his Ivory-billed/Pileated plate is probably the most artistically attractive in the guide. My only contentions with Malick's work is that he got away with giving a Golden Eagle a miniature beak and that he didn't get away with illustrating all the raptors. Pendleton's kite/harrier plate and first buteo plate, while accurate, simply detract from a brilliant treatment of this exciting bird group. Interestingly, the Pendleton Phasianidae and hawks-in-flight plates are more than adequate and are another good example of the intra-artist inconsistencies mentioned earlier.

John O'Neill, along with Doug Pratt, makes up the LSU art-manfia which is well-represented in the guide. O'Neill's extensive field work in South America made him a natural for the parrot/trogon plates which are of the highest quality. His orioles are equally good. Unfortunately, the swallows, an elegant

and colorful group of birds, are represented quite awkwardly with stiff posturing and heads too small. O'Neill's Bobolinks, suffer a similar proportional impropriety.

O'Neill's colleague, Doug Pratt, is the best represented artist in the NG guide, which is to the guide's credit as Pratt's plates are excellent. Pratt provides little fuel for criticism, and he has very few distracting paintings. These distractions are barely significant, but why is his female Red-breasted Nuthatch so frazzled, and where did his Connecticut Warblers get their big red feet? Pratt treats the hummingbirds and the bulk of the doves and songbirds with perfection. His obvious knowledge of bird behavior and anatomy combines to create a style better suited, perhaps, for fine art prints. The result is a series of plates containing nearly three-dimensional figures. It is difficult to pinpoint any one outstanding plate by Pratt, but, his stop-action hummingbirds come as close to capturing their brilliant iridescence as any hummingbird painting I've seen.

Chuck Ripper's alcids and swifts were a pleasant surprise. Having seen many of his line drawings in various publications over the years, it was a treat to see equally outstanding and even more lifelike color portraits. Diane Pierce also fits into this pleasantly pleasing category. I once examined a display of her paintings in Columbus, Ohio, in the late 70s. It was apparent that a technical skill was there, but so were anatomical inconsistencies. Since that time her efforts have improved noticeably and her plates are generally consistent and accurate. I particularly like her renderings of sparrows and other seed eaters in typical vegetation and landscapes (I don't find the backgrounds distracting in the least). A white-eyed Rufous-sided Towhee would have been a useful addition to the towhee plate. Pierce's flamingo-jabiru-Woodstork plate is outstanding. The only exceptions to her excellence is the series of Black-crowned Night-Herons which appear unnaturally stiff and squat and her short-legged Sandhill Cranes. Also, the adult Tricolored Heron seems to be mislabeled in "breeding" plumage. A breeding Tricolored should exhibit dark, slate-blue neck coloration as well as darker and brighter cobalt bill and legs.

Thomas Shultz's skuas, gulls and terns are adequate representations of this large group. However, because of the often pale coloration in gulls and terns, many of these plates deserved a darker background to better differentiate the birds from their printed surroundings. Schultz's jaegers, appearing in four rows of alternating direction create an uncomfortable tension that may distract the user enough to interfere with identification. And, while a few other plates illustrate opposite-facing birds, only the jaegers seem disconcerting.

Fortunately for reviewers and readers alike, the Golden Guide features only one artist. Arthur Singer's birds appear consistently accurate and attractive throughout the guide. Singer's work probably represents the most comprehensive, single- volume coverage of birds that has been completed by any artist. And there is little worth criticizing. A few of his new plates (immature terns, gannet and boobies, Florida and Alaska stragglers) seem to have been done hurriedly and lack the neatness and precision of his earlier work.

The few problems associated with the Robbins guide have little to do with the artist. The range maps are generally better in the new edition, however the use of state boundaries (as in the NG guide) would have added a useful reference. The quality of printing is inconsistent throughout the revised guide. The rearranged gulls on page 143 look faded and out of focus

as if the birds were cut out and reassembled on poster board. Most of the other large gulls seem to have this problem as well. Several plates just look washed out, including the grackles and cowbirds, yellow orioles, and crossbills. The towhees look very grainy and a little anemic, while the goldfinch yellows are day-glow bright while other colors are faded. It is unfortunate that my tea-stained, mildewed first edition contains brighter, more lifelike plates than the revised edition. Poor-quality printing also reduced the utility of the pipit tail line drawings. They are virtually indistinguishable from one another. While it is doubtful that the lower quality printing has created identification problems, it is unfortunate that Singer's high quality work has been sacrificed for an inexpensive cover price. I would have gladly paid an extra dollar or two for art reproductions equivalent to the NG guide.

One last contention with the Golden Guide is Robbins' insistence on including sonograms for many species. A compelling argument is given on the utility and value of 2-dimensional representations of bird song. But imagine trying to enjoy your favorite Beethoven or Blues Brothers tune by reading the score. It's just not the same as a recording or live performance. I doubt many music lovers would buy a recording based on a paper image, as I doubt many birders have found sonograms useful in the field.

Finally, which one should you buy? Despite all my criticisms, I like them both. In neither guide were anatomical and printing errors great enough to seriously affect accurate field identification. However, a good deal of variation in quality of plates is inherent to both guides. NG's variation is due to the large number of artists used while Robbins' variability is apparently the result of budget printing. The Golden Guide will remain my back-pocket guide, but I'll also find ways of taking the larger guide along; even if it stays on my car's front seat, or I start carrying a small backpack. I often find myself picking up the NG guide simply to enjoy the illustrations and their inherent variety. I'm not compelled to do this with the Robbins guide, although the revised edition should remain the standard field companion for all birders. But get the National Geographic guide, too. Its beautiful, spacious plates will provide enjoyable book watching while being a most practical field reference for bird watching.—**David S. Maehr**, Florida Game & Fresh Water Fish Commission, Wildlife Research Laboratory, 4005 South Main Street, Gainesville, Florida 32601.

Florida Field Naturalist 12: 72-75, 1984.

A guide to the birds of Puerto Rico and the Virgin Islands.— Herbert A. Raffaele. 1983. Fondo Educativo Interamericano, San Juan. 256 pp., 24 color plates, 17 black and white plates, 9 maps. $13.95 paperback.—This well-written book is the first comprehensive guide to the 273 species of birds known from Puerto Rico and the Virgin Islands (British and United States). Winter visitors, 47% of the avifauna, are described and illustrated making a second volume for identification of North American migrants unnecessary. I particularly appreciate inclusion of the legion of introduced species (the author lists 32 species breeding in the area and 18 as yet not established), which eliminates the need for guides to the birds of Africa, Australia, South America, and Asia.

Aside from being a fine field guide to the area's birds, the book includes summaries of the biogeography of the region, ecology of avian populations, and a discussion of the problems of conservation in the West Indies, including the causes of extinctions and endangerment, fossil birds (updated with unpublished data by Storrs Olson), pressures facing local avian populations, and an excellent section on conservation measures proposed by the author. Finally, Raffaele has provided visitors to the islands with a most useful section entitled "Places to Bird" that will help make a short stay more productive. This section describes four sites in Puerto Rico and three in the Virgin Islands (two contributed by local birders Jim Riddle and Robert Norton).

However, Raffaele's major contributions are his presentation of a wealth of heretofore unpublished information on the natural history of the region's birds and in his updating (through July 1981) of the avian records for the region; a considerable task considering the much dispersed literature and unpublished records Raffaele has collected. In addition, the author has presented his own considerable list of new records. Dr. Raffaele is eminently well qualified for this task. He has visited the island many times since his first trip in 1963 and resided in Puerto Rico for 6½ years while he worked as a wildlife biologist for the Commonwealth Department of Natural Resources. More recently he completed his Ph.D. research in Puerto Rico.

All species are illustrated, and the illustrations are very well done, particularly those by Cindy House, who visited the islands to observe the birds before completing her illustrations. Full-page color plates are presented for four of the 14 endemic species. All other endemics (except the PR whip-poor-will [=Puerto Rican Nightjar]) are illustrated among the remaining 20 color plates. Seventeen black and white plates are used to illustrate species for which color is not critical in identification. The plates use the (Roger Tory) Peterson System of pointers to direct the reader to key characters of identification. Although the plates are well presented, it would have been useful if they were cross-referenced to the species accounts in the text and if Spanish common names were given. Nine maps illustrate the region and specific birding localities.

Raffaele has selected or coined common Spanish names to eliminate some of the local misnomers and to standardize local names with those used internationally. A Spanish version is planned for 1984.

Unfortunately the publisher did not commit as much effort in the production of this book as did the author. The pages of my copy began falling out after only a few openings.—**James W. Wiley**, Apto. 21, Palmer, Puerto Rico 00721.

Florida Field Naturalist 12: 75-76, 1984.

Seabirds: an identification guide.—Peter Harrison. 1983. Boston, Houghton Mifflin Company. 448 pp., 88 color plates, 31 black-and-white figures, 324 distribution maps. $29.95.—It took the author eleven years to research and compile this guide. Seven of those years were spent travelling throughout the world, not only visiting every major seaport, but spending part of that time working as a deckhand aboard fishing vessels, thus enabling him to more easily study and sketch many seabirds. Just imagine the experiences of observing all but 30 of the world's known species of seabirds. One can only drool with envy! The result of Harrison's efforts is the most thorough examination ever of the field characters of the world's 312 seabird species. Seabirds consists of six basic sections: Introduction; Art Plates and Facing Captions; Systematic List and Main Text; Distribution Maps; Selected Bibliography; and Index. A glossary and sketch of the topography of a seabird precede the introduction. The Introduction includes discussions of the pitfalls of birding at sea (known all too well by any birder who has taken a pelagic trip) and of the basic seabird characteristics vital to differentiating various families and species therein.

What most birders examine first when evaluating an identification guide are the illustrations. None will be disappointed with these. The color plates, featuring over 1600 birds, are beautifully done and, in most instances, accurately depicted. Harrison is truly a marvelous artist who captures the "jizz" (the overall impression that immediately distinguishes a particular species) of each species as well, if not better, than any other artist of his kind. The fact that he observed "in the wild" most of the species he illustrated is quite evident in his work. He gives special attention to relevent facts not found in other guides. Especially helpful is that virtually all subspecies which can be differentiated through field characteristics are illustrated. For example, both races of Yellow-nosed Albatross are illustrated, yet North American guides published prior to Seabirds depict the "white-faced" race (*bassi*) rather than the "gray-faced" nominate subspecies (*chlorohynchos*), the only one known to occur in North American waters. Also, all immature plumages that one is likely to encounter are illustrated: I wonder how many birders, during their first summer encounter with the Common Murre, have been frustrated when trying to identify the "murrelets" accompanying the murres? I certainly was, because North American guides fail to explain that young Common Murres leave their ledges "18-25 days after hatching" (according to Seabirds) and, when observed at a distance, these birds, (of course, not illustrated in American guides) resemble murrelets.

To allow quick reference, concise notes taken from the main text appear on the left page opposite the species illustrated. Also included here are the species' average length and wingspan, plus the page numbers for its range map and main text. The main text discusses the field characteristics of each species and subspecies in detail. Preferred habitat, behavior, manner of flight, egg and fledgling dates, and characters differentiating similar species are also discussed. Black-and-white illustrations are included when differentiation of special features is warranted. Unlike the illustrations which are grouped according

to similarity of features, species in the main text are listed taxonomically. However, the species numbering system, which allows one to go quickly from a species' illustration, to its place in the main text, to its range map, and back, are evidence of Harrison's careful approach to putting the book together. At the end of the main text, the author briefly discusses sea-ducks and refers the reader to various guides for more indepth discussions of this group. Also included here are three pages of black-and-white illustrations of the 20 species of ducks that frequent seas and bays. Too bad Harrison did not illustrate these in color also—the male eiders and Harlequin Duck would have been grand finishing touches to his artistry. The style of the range maps are similar to those of other world distribution maps, but ranges are depicted much more accurately than in most. This is a major accomplishment in itself. Breeding, non-breeding and migratory distribution are clearly indicated. And for those who truly want to increase their knowledge of seabirds, the bibliography is well worth examining. Each entry is cross-referenced to the main text and most sources included are available through major university libraries.

Unfortunately, in describing the plumages and molts of species, like other noted British writers, the author chose to continue the use of obsolete terms such as "first-winter" (acquired "about August"), "first-summer" (attained in March), "adult non-breeding" (instead of adult basic), etc., rather than adopt the Humphrey-Parkes system which is a much more precise and sensible approach. As most respected British field ornithologists stress the importance of correctly ageing a species (and rightly so), it seems strange that British authors continue to use obsolete terminology. There are a few shortcomings in the color plates. Certain features in some of the illustrations are inaccurate (i.e., coloring of "juvenile" Masked Booby and "first-winter" Thayer's Gull, bill-color of Royal Tern); a few illustrations fail to depict some diagnostic field characteristics (i.e., the well-defined pale border around the primary tips of "first-winter" Thayer's Gull, the barring on the upper- and under-tail coverts of "juvenile" Lesser Black-backed Gull); and some particularly important plumages and soft-part colorations are left out entirely (i.e., juvenal plumages of both Ring-billed and Laughing gulls and yellowish bill of juvenal-plumaged Royal Tern, often retained well after these species leave their breeding grounds). Inaccurate details also occur occasionally in the written text. The Western Grebe, *not* the Red-necked, is "the largest North American grebe." "Juvenile" Thayer's Gull primaries are not "*uniform* greyish-brown" (emphasis mine), but are as I described previously. The introductory paragraph for Royal Tern limits the breeding range to "Coasts of Central America and equatorial West Africa," yet it breeds quite extensively in southern North America. Unfortunately, the bibliography omits titles of journal articles, and also inadvertently omits at least eight references used in the text (including Atherton and Atherton 1980). However, I consider such just minor flaws for a book that encompasses so much.

What impresses me most about Seabirds is that it includes not only the field characteristics needed for differentiating species—typical of most identification guides—but also all other pertinent information that one might need when doing preliminary research. Thus, it is no wonder that Seabirds was selected as British Birds' "Best Bird Book of the Year." If such an award

existed in North America, no doubt it would win here, too. All field ornithologists should be grateful that Harrison had the perseverence (and, certainly, patience) to complete this tremendous undertaking in such a relatively short time. Unfortunately, Seabirds is not available in softcover form and is not really suitable for carrying in the field (other than in one's car "library"). Its bulk and cost will discourage most birders from carrying it in-the-hand while dodging the saltwater on pelagic trips. Essentially, it is a reference book for one's home library and no serious birder should be without it!—**Lyn Atherton**, P.O. Box 58124, Tierra Verde, Florida 33715.

Florida Field Naturalist 12: 77-79, 1984.

REPORTS

Summary of the 1984 spring meeting.—The Florida Ornithological Society held its annual meeting, 27-29 April 1984, in St. Petersburg, Florida with Dave Goodwin and the St. Petersburg Audubon Society as hosts. Fred Lohrer highlighted the recently completed handbook on "How to host an FOS meeting" and thanked members who assisted him in its preparation. He received special thanks from the Board of Directors and members-at-large. The revised Articles of Incorporation were approved by the Board with all members present. A copy of the articles will be mailed to members so they may vote on them at the fall meeting. Thanks were extended to the St. Petersburg Audubon Society for their gift of $100 to the Research Fund. The FOS will recognize the 50th anniversary of the Peterson Field guide to the birds with a letter of appreciation composed by Bill Hardy. Wayne Hoffman, chairman of the nominating committee, recommended Bob Brown, Mary Davidson, and Jack Dozier to serve as board members. They were unanimously elected at the annual membership meeting.

Glen Woolfenden was moderator of a panel discussion about the new field guides available to birders and Lyn Atherton, Wayne Hoffman, Howard Langridge, and Fred Lohrer were featured participants. Manny Alvarez correctly identified all skins in the quiz prepared by Glen Woolfenden. A bird song quiz, a new feature, was prepared by Jeff Moore and won by Henry Stevenson. President Kittleson and Past-president Below recognized Caroline Coleman for her extraordinary service as treasurer with a gift. Our banquet was highlighted by a surprise visit from Governor Bob Graham, and a talk by Benton Basham on his birding adventures in 1983 when he sighted 711 species of birds in North America.

The 1984 fall meeting will be held in West Palm Beach, 5-7 October, with Howard Langridge as the local chairman. Steve Nesbitt and James Rodgers have invited FOS to Gainesville in April 1985.—**Marsha S. Winegarner,** Route 2, Box 180, Lake Placid, Florida 33852.

Florida Field Naturalist 12: 79, 1984.

FLORIDA ORNITHOLOGICAL SOCIETY, INC.
TREASURER'S REPORT, 1983

TOTAL FUND BALANCE, cash in banks at year-end

	1982		1983
Checking account	$ 7,072.32	Checking accounts	$ 6,871.12
Research certificate	1,341.65	Research certificate	1,543.88
Capital certificate	2,184.16	Capital certificate	2,513.39
	$10,598.13		$10,928.39

1983 CASH RECEIPTS AND DISBURSEMENTS

TOTAL FUND BALANCE, 1 January 1983 ..... $10,598.13

Cash Receipts		*Cash Disbursements*	
Membership dues	$ 3,119.00	Membership	439.96
Meetings	4,139.10	Meetings	3,338.38
FFN	561.50	FFN	5,308.52
Interest	1,231.38	Operating	421.03
Special publications	1,031.75	Newsletter	449.58
Research fund	159.50		$ 9,957.47
Special projects	45.50		
	$10,287.73		

TOTAL FUND BALANCE, 31 December 1983 ..... $10,928.39

ACTUAL INCOME AVAILABLE FOR USE DURING 1983

TOTAL CASH RECEIPTS, 1983		$10,287.73
Add 1983 dues received before 1/1/83	$2,070.00	
Add 1982 Vol. 10:4 (payment made in 1983)	967.05	
Less 1984 dues received before 1/1/84	315.00	
Less Research Fund receipts, 1983	159.50	
Less Special Publication fund receipts, 1983	1,031.75	
ACTUAL INCOME, 1983		$11,818.53
CASH DISBURSEMENTS, 1983		9,957.47
EXCESS INCOME OVER DISBURSEMENTS		$ 1,861.06

25 April 1983.—**Caroline H. Coleman,** Treasurer, 1701 NW 24th St., Gainesville, Florida 32605.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The Florida Field Naturalist is a refereed journal emphasizing biological field studies or observations of vertebrates, especially birds, in and near Florida, the Bahamas, and Antilles. It welcomes submission of manuscripts containing new information from these areas. Please consult recent issues for style and Vol. 11, No. 1 for detailed instructions. Submit manuscripts for publication to the Editor in triplicate. Send books and other materials for review to the Associate Editor (for reviews) Fred E. Lohrer. For information and preliminary assistance regarding submission of reports on bird distribution and rarities, contact the Associate Editor (for distribution reports) Oron L. Bass, Jr. For preliminary assistance regarding submission of scientific and technical contributions, contact the Associate Editor (for scientific reports) William B. Robertson, Jr.

FLORIDA ORNITHOLOGICAL SOCIETY SPECIAL PUBLICATIONS

Species index to Florida bird records in Audubon Field Notes and American Birds volumes 1-30 1947-1976, by Margaret C. Bowman. xii + 42 pp. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00. Order prepaid from the Vice-President.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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All members receive the *Florida Field Naturalist* and the *Newsletter*. Subscription price for institutions and non-members is $10 per year. Back issues ($3.00 per issue) are available, prepaid, from the Vice-President. Notice of change of address, claims for undelivered or defective copies of this journal, and requests for information about advertising and subscriptions should be sent to the Treasurer.

The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 12, NO. 4 NOVEMBER 1984 PAGES 81-116

WOOD STORK FEEDING AREAS IN SOUTHWEST FLORIDA

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The largest nesting colony of the Wood Stork (*Mycteria americana*) in the United States occurs in southwest Florida at Corkscrew Swamp, a protected sanctuary of the National Audubon Society. The nesting birds at Corkscrew feed on fish that become concentrated in shallow ponds by the seasonal (November-May) drying of extensive wetlands (Kahl 1962, 1964). Concentrations of fish suitable for Wood Stork feeding are available for only a limited time at any one location; but the Wood Stork, a long-distance flyer that can exploit thermals, has a broad feeding range, and the seasonal dry-down does not concentrate fish in all ponds simultaneously (Kushlan et al. 1975, Ogden et al. 1976). The nesting success of storks at the Corkscrew colony depends upon the availability of concentrations of fish within flight distance of the colony throughout the 4-month nesting season. This report, based on an aerial survey of feeding Wood Storks, identifies the feeding areas of the Corkscrew colony and the sequence in which they were used during the nesting season of 1973-74.

METHODS

The survey, conducted from 15 December 1973 through 26 May 1974, covered parts of Collier, Hendry, Lee, Charlotte, and Glades counties, Florida. Flights were made daily for the first seven days; subsequent flights were made on one or two days approximately every two weeks. The flights, in a single engine Cessna 150, 172, or 175, originated and terminated at Page Field in Ft. Myers, Lee County.

---

[1]Present address: Southeast Fisheries Center, National Marine Fisheries Service, Miami, Florida 33149

Florida Field Naturalist 12: 81-96, 1984.

TABLE 1. Number of Wood Storks seen per hour and per kilometer of flight from 15 December 1973 through 26 May 1974.

Date	Hours in Flight	Kilometers Covered[1]	Number of Wood Storks[2]	Wood Storks per Hour	Wood Storks per Km
Dec 15-21	28.3	1,210	733	25.9	0.606
Jan 12	6.0	403	246	41.0	0.610
Jan 25-26	7.9	635	407	51.5	0.641
Feb. 9	7.5	655	328	43.7	0.501
Feb 23	8.2	487	275	33.5	0.565
Mar 9	7.5	639	390	52.0	0.610
Mar 26	5.0	416	410[3]	82.0	0.986
Apr 16-18	12.5	1,015	440[4]	35.2	0.433
May 2, 3, 5	14.9	1,552	163[5]	10.9	0.105
May 20	3.8	387	38	10.0	0.098
May 26	3.6	161	230	63.9	1.429

[1]Within study area.
[2]Other than at rookery.
[3]Total of 546, including observations by others as cited in Table 2.
[4]Total of 501, including observations by others as cited in Table 2.
[5]Total of 243, including observations by others as cited in Table 2.

Wood Stork feeding sites were located and recorded on each flight, and feeding sites of large aggregations of other wading birds were also noted. Feeding Wood Storks were routinely spotted from an altitude of 300 to 450 meters (1,000 to 1,500 ft) and their identification was verified with binoculars at 150 to 300 m (500 to 1,000 ft). Wood Storks were easily distinguished from other white wading birds by their large size.

The entire five county area could not be covered on each flight because of its size; nor was it possible, except during intensive periods of reconnaissance such as the first week, to follow individual birds from Corkscrew to their feeding sites because of time limitations. Instead I determined the direction of the flight of birds to and from the Corkscrew rookery and concentrated searches along that vector, or I searched areas where Wood Storks had been seen feeding on the previous flight or where water conditions appeared suitable for Wood Stork feeding. A cue that seemed useful to me (and also may be useful to foraging birds) was the ring of exposed mud between the marsh vegetation and the receding water line of ponds. Flights were directed over areas where previous observations suggested this condition might exist.

Flights were made 15-21 December, 12 January, 25 and 26 January, 9 February, 23 February, 9 March, 15 March, 26 March, 16-18 April, 2, 3, and 5 May, 20 May, and 26 May. Approximately 110 hours were spent in the air and 8,065 km (5,000 miles) (estimated straight flight) were covered. Sightings by other observers on 15 March and 8 April are also included in this report.

Results and Discussion

Background

Records of the approximate number of nesting pairs and the number of fledglings produced at the Corkscrew colony have been maintained by the National Audubon Society since the 1956-57 nesting season. Highest production within this time occurred in 1960-61 when 6,000 nesting pair raised 17,000 fledglings. Both the number of nesting pairs and the frequency of successful nesting seasons has declined since then, probably because the extensive drainage of southwest Florida in the late 1960's and early 1970's reduced the area of seasonally flooded wetlands by approximately one half (Browder 1976).

The nesting season of 1973-74 was the first of three concurrent nesting seasons that each resulted in the production of several thousand fledglings. Approximately 3,800 were raised in 1973-74, 5,900 in 1974-75, and 4,100 in 1975-76. Thereafter, the highest number of fledglings produced at the Corkscrew rookery was 2,140 in 1979-80 (Alexander Sprunt, IV, pers. comm.).

The dry season of 1973-74 was the driest in the record of the National Weather Service at Page Field in Ft. Myers (U. S. Dept. Comm. 1973, 1974). Only 8.1 cm of rain fell from 1 October through 15 May and only 77.5 cm had been recorded during the last four months of the preceding wet season. Despite the low rainfall, the Wood Storks at the Corkscrew rookery had their first successful nesting season in three years (Browder 1978).

Wood Storks began congregating in the Corkscrew area in November but did not begin building nests until late January, possibly because of a hard freeze in December. Eggs began hatching approximately 23 February. According to Kahl's (1962) description of their bioenergetics, the food requirements of the hatchlings must have been greatest in late March and April. By 2 May, fledglings were soaring above the rookery, and by 21 May some of them were foraging outside the rookery. By the end of May the Corkscrew rookery was almost empty and many of the Wood Storks had left south Florida (Fig. 1).

Observations

At least 300 birds were seen during most one or two-day flights (Table 1). The number of Wood Storks seen per hour of flight reached a maximum of 82 on 26 March and fell to a minimum of 10

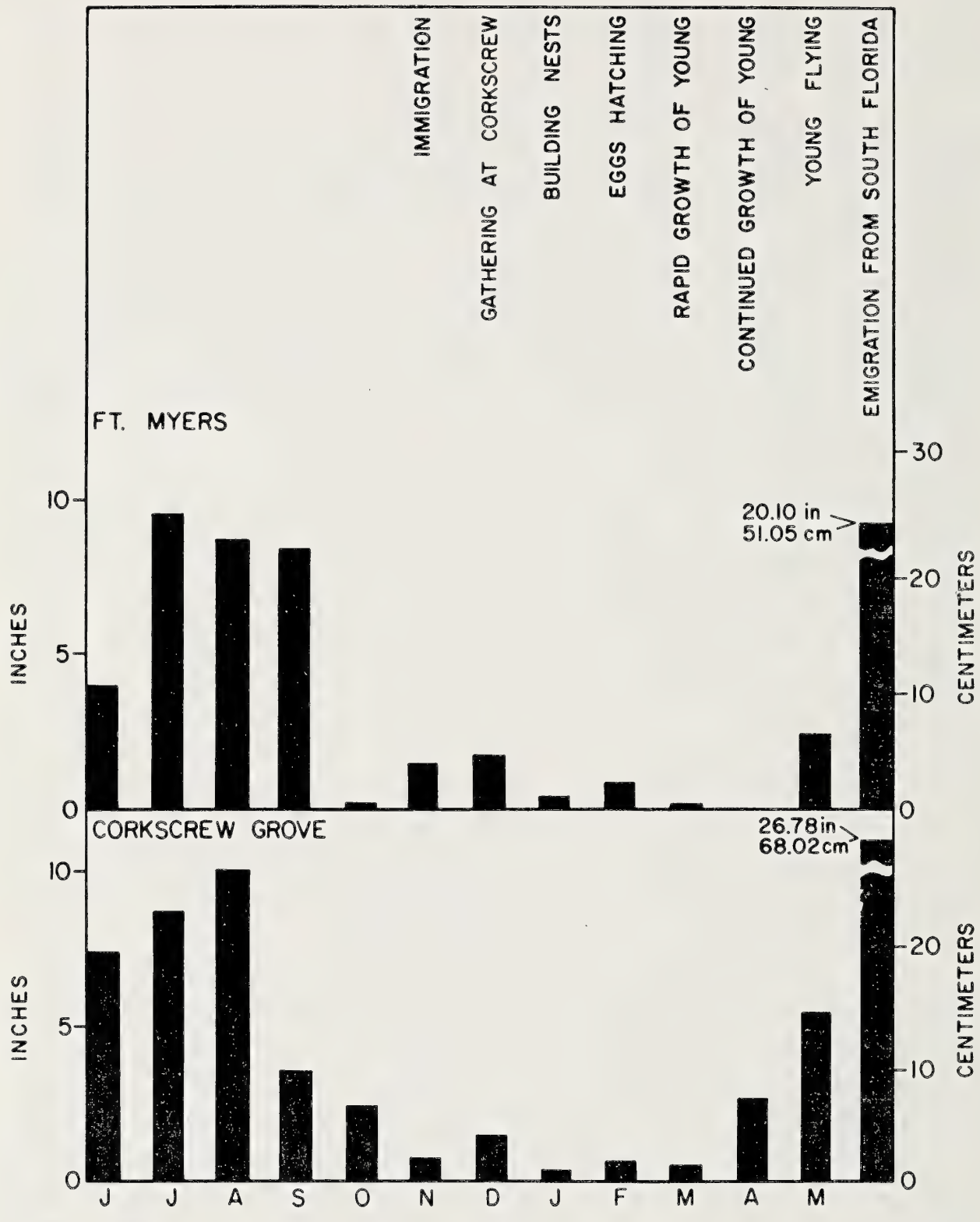

Fig. 1. The timing of breeding activities at the Corkscrew rookery in relation to monthly rainfall measured at Page Field in Ft. Myers (U. S. Dept. Comm. 1974, 1975) and Corkscrew Grove immediately north of north Corkscrew Marsh (ALICO pers. comm.).

on 20 May (Table 1). There may have been some bias in favor of sightings in ponds located in sloughs rather than in ponds located in strands because birds feeding in open ponds were more easily spotted from the air than those in ponds surrounded by cypress. Centers of Wood Stock feeding activity were, however, obvious from the air, even from long distances, because birds were almost continuously approaching or leaving such areas, and feeding birds often rose in mass and circled above the ponds before resettling to continue feeding.

Wood Storks were seen feeding at 38 sites (Fig. 2). The various wetlands in southwest Florida are shown by name in Fig. 3. Thirty-nine sites are indicated in Fig. 3 and listed in Table 2. Area No. 1, Rainey Slough, was included as a feeding site, even though I did not actually see any Wood Storks feeding there, because the flight patterns of birds seen in the air near there suggested that it was an important feeding area. Numbers indicate locations where birds were seen in approximately the order in which birds appeared to be using the areas. The numbers correspond to those in Table 2, which lists the locations by date of sighting and number of Wood Storks seen. Locations and dates of sightings of other species of feeding wading birds are given in Table 3. Some of the Wood Stork feeding sites indicated in Figs. 2 and 3 appear to coincide with general areas of concentrations of feeding White Ibis (*Eudocimus albus*) identified by Kushlan (1979).

Pattern of use

Foraging Wood Storks followed the dry-down in Southwest Florida, feeding in upland ponds at the beginning of the dry season and in lowland ponds in the latter part of the season. When the ponds of one area had dried or become depleted, the birds moved to another area where the dry-down was in an earlier stage. In general the birds frequented wet prairie ponds at the beginning of the season and slough ponds later. Feeding centered near Fisheating Creek at the beginning of the season. Then activity was concentrated first near Immokalee, then in the Big Cypress Swamp and the Fahkahatchee Strand, and finally, in the marshes inside the dike at Lake Okeechobee. The Okaloacoochee Slough and Corkscrew Marsh were used extensively by Wood Storks throughout the breeding season. These areas provided suitable feeding habitat for the storks for a long period because their ponds are at several elevations and do not dry at the same time. The feeding birds were seen in the Big Cypress Swamp in March. The Fahkahatchee Strand was

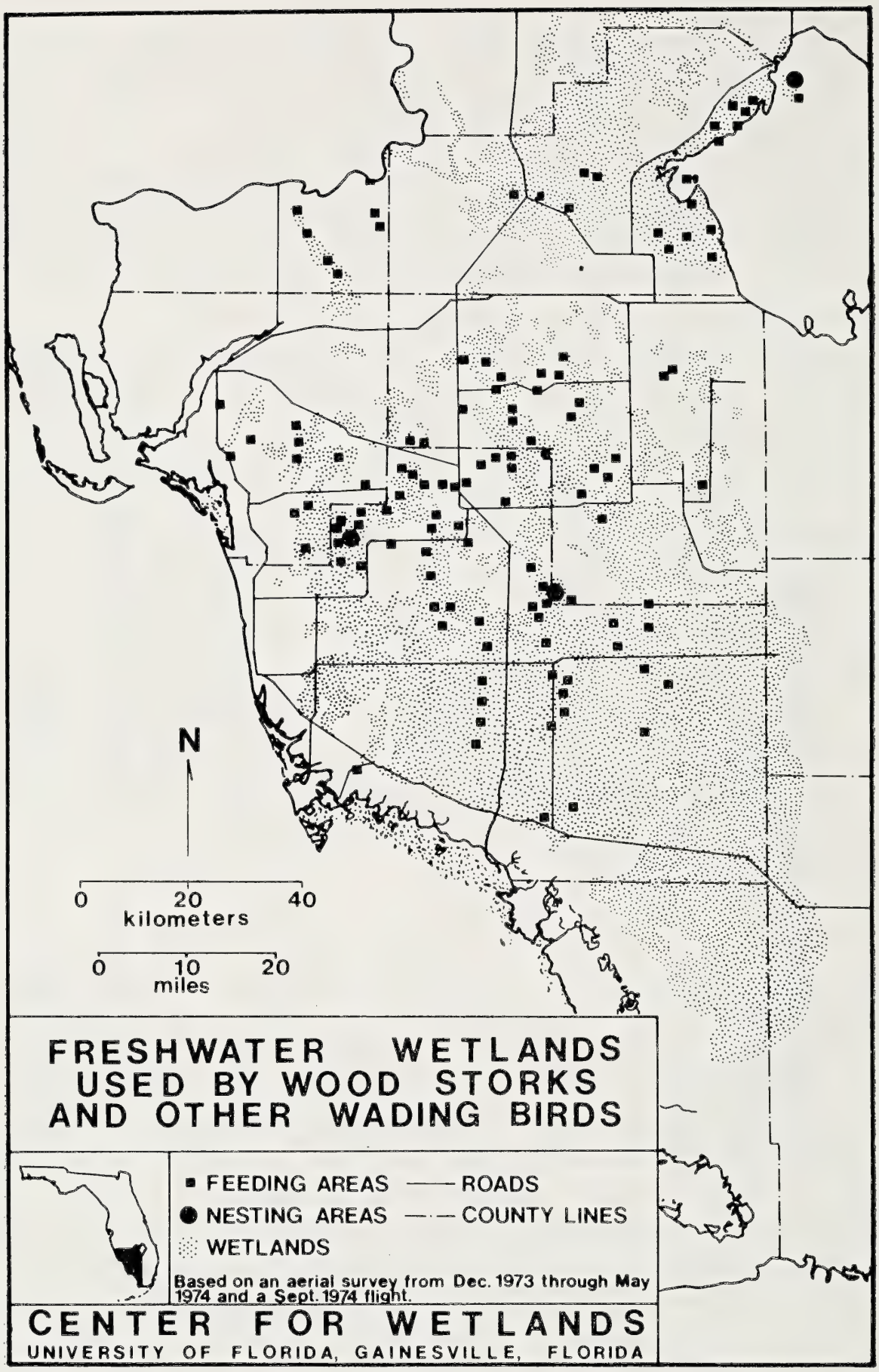

Fig. 2. Location of wetlands (stippling) and of nesting (dots) and feeding sites (squares) used by Wood Storks in southwest Florida during the breeding season of 1973-74.

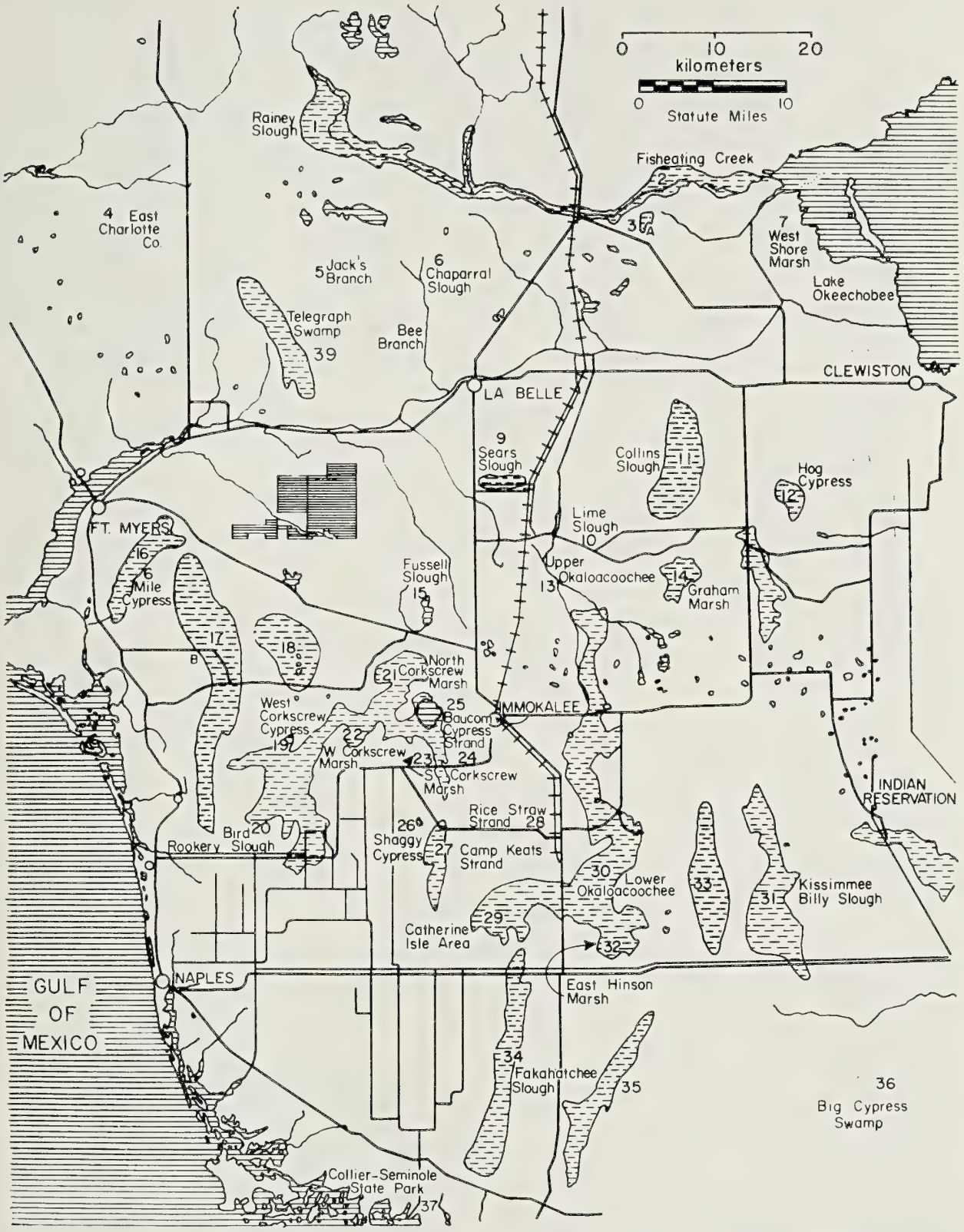

Fig. 3. Map of wetlands of southwest Florida with feeding areas of Wood Storks numbered in order that Wood Storks were seen there. Map based on county maps of the Florida Department of Transportation.

TABLE 2. Number of Wood Storks seen in feeding areas.

	Dec. 15-21	Jan. 12	Jan. 25-26	Feb. 9	Feb. 23	Mar. 9	Mar. 15	Mar. 26	Apr. 8	Apr. 16-18	May 2, 3, 5
1. Rainey Slough	0										
2. Fisheating Creek	96										
3. Marsh A-Glades				100							
4. East Charlotte			18								
5. Jack's Branch			34								
6. Chaparral Slough	29										
7. Lake Okeechobee										15	151
8. Clewiston					6						
9. Sears-Keri Area	212	16	22		6						7
10. Lime Slough				3							
11. Collins Slough			80								
12. Hog Cypress	99										
13. Upper Okaloacoochee	11		25	25	18		8[1]			4	
14. Graham Marsh		52									
15. Fussell Slough	60										
16. Six Mile Cypress		1									
17. Marsh B-Lee	9	49	82	21							
18. Marsh C-Lee	9	48		6							
19. Western Corkscrew Cypress						7		42		225	
20. Bird Rookery Strand					55	17		29		1	
21. North Corkscrew Marsh 18	18			8			8[1]	5		15	
22. West Corkscrew Marsh			8			11		106[2]		51	
23. South Corkscrew Marsh		11	65			3				1	

TABLE 2. (Continued)

	Dec. 15-21	Jan. 12	Jan. 25-26	Feb. 9	Feb. 23	Mar. 9	Mar. 15	Mar. 26	Apr. 8	Apr. 16-18	May 2, 3, 5
24. Baucom Cypress Strand			53			9		30[3]		50[3]	
25. Immokalee	80	29	20	4			1[1]				
26. Shaggy Cypress				102							
27. Camp Keais Strand				9				10			
28. Rice Straw Strand						15					
29. Catherine Isle Area	30				19			223	+100[4]	4	
30. Lower Okaloacoochee		40		50	16	93	84[1]			75	4
31. Kissimmee Billy Strand					27						
32. East Hinson Marsh						33	8[1]				
33. Marsh D Collier-Hendry					106	16					
34. Fahkahatchee Strand							2[1]	101	+100[4]	11[4]	1
35. Big Cypress Turner Road					17	66				14	
36. Big Cypress-Central						120					
37. Collier-Seminole Park 80					5						
38. Coastal Ridge										35	80[5]
39. Telegraph Swamp										8	

[1]James Hansen, biologist at Corkscrew Swamp Sanctuary.
[2]100 at Flowing Well Pond by Jerry Cutlip, Sanctuary Manager.
[3]Carlos Blasquez, Associate Professor of Plant Pathology, University of Florida, Agriculture Experiment Station in Immokalee.
[4]Connie Ryan, Florida Forest Service, LaBelle.
[5]James Hansen, Phyllis Hansen and Patricia Caulfield.

TABLE 3. Observed feeding areas for wading birds other than Wood Storks.

Dec. 15-21	Catherine Island Area, Mangroves, Big Cypress, Rainey Slough, South Lee County Marshes, Bird Rookery Strand, Okaloacoochee Slough, Sears-Keri Area, Hog Cypress
Jan. 12	South Lee Marshes, Okaloacoochee Slough, Graham Slough
Jan. 25, 26	Corkscrew Marsh, Collins Slough
Feb. 9	Lake Okeechobee, Catherine Island Area, Okaloacoochee Slough (Sunniland Area)
Feb. 23	Camp Keais, Mangroves, Kissimmee Billy Slough
March 9	Okaloacoochee Slough
March 26	Not noted
April 16, 17, 18	Not noted
May 2, 3, 5	Lake Okeechobee
May 26	Lake Okeechobee

the site of intensive feeding in April. The Wood Stork population used the *Eleocharis cellulosa* marshes on the western and northwestern shores of Lake Okeechobee during late April and throughout May, when the rest of southwest Florida had dried. Irrigation ditches surrounding truck farms and pastures and the drying beds of canals on the coastal ridge were the only other sites where feeding Wood Storks were seen in early May (Fig. 4).

Lake Okeechobee feeding sites were as far as 97 kilometers (60 miles) from the rookery. Feeding at Lake Okeechobee coincided with the occurrence of strong thermals over southwest Florida. The survey plane followed the storks up to approximately 1,525 meters (5000 feet on altimeter) on thermals near the rookery in May. (The birds would soar in circles to ride a thermal to altitude, then glide in a straight line in the direction of the feeding site. Once altitude was lost, the birds might detour from their flight line to find another thermal.)

The general sequence of use of feeding areas by Wood Storks as the dry season progressed followed the primary slope of the land and was from the north to the south. The Wood Storks foraged at the greatest distances from the rookery at the beginning of the season, before eggs were laid, and near the end of the season, when the young were large. They worked nearest to the rookery during incubation and the early stages of raising young.

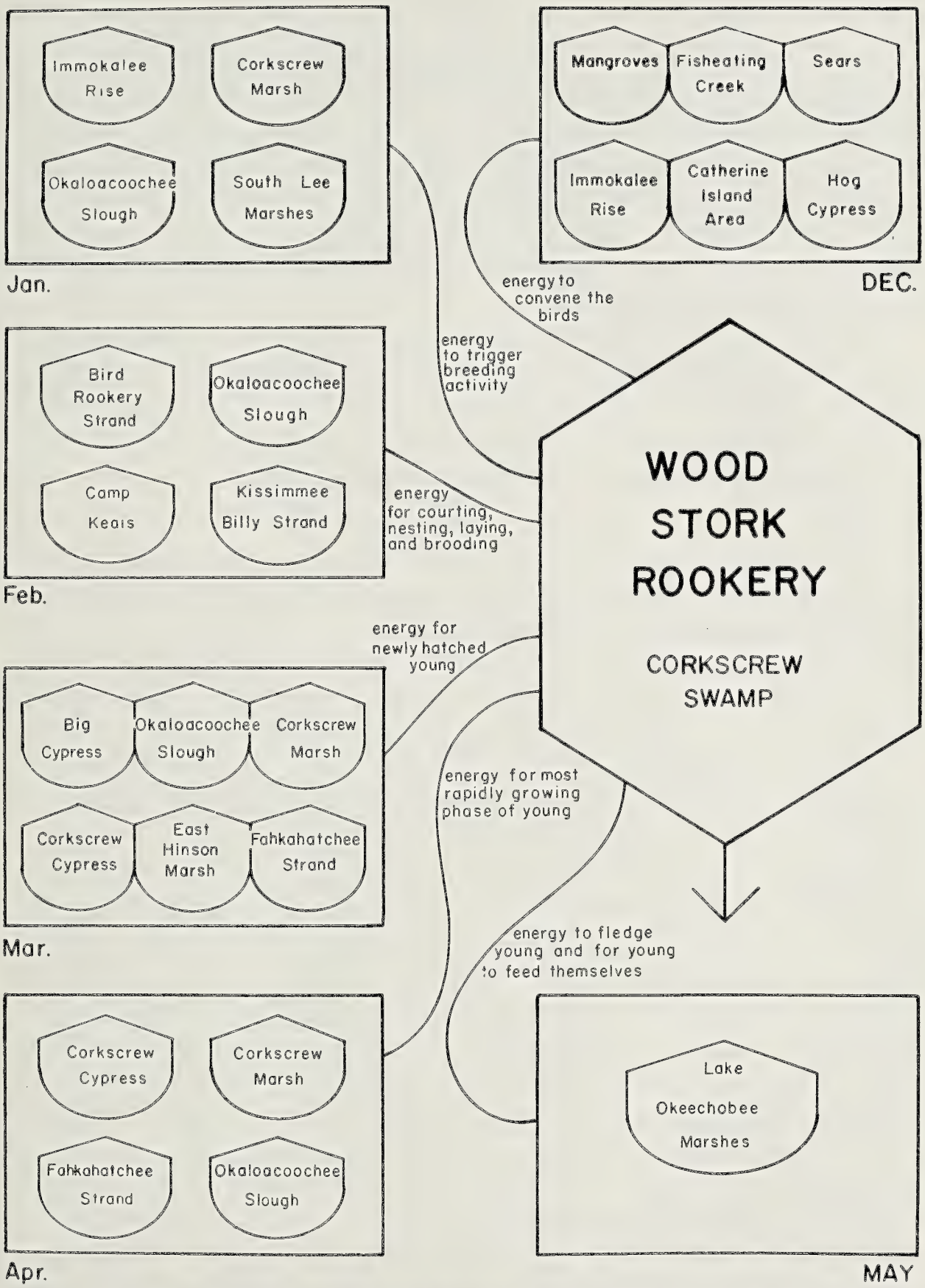

Fig. 4. Major feeding areas used by birds from the Corkscrew Wood Stork colony in relation to nesting activities. Tank-shaped symbols represent storages of food. Lines represent flows of wood to the Wood Stork rookery. The hexagonal shaped symbol represents an organism or group of organisms that obtains food in proportion to its total biomass.

Other wading birds

Other wading birds were feeding in the same general areas as the Wood Storks and were much more abundant than the Wood Storks (Table 4). The number of other wading birds per Wood Stork seen on survey flights was similar throughout the season except at the beginning and end of the season when the number of other wading birds relative to Wood Storks was very high and on flights in March when the number of other wading birds relative to Wood Storks was very low.

On most of the flights I saw about 15 other wading birds to every Wood Stork. Since there were about 3,800 Wood Storks in the area from the Corkscrew colony, the ratio of 15 other wading birds to one Wood Stork suggests that there were about 57,000 other wading birds feeding in southwest Florida during most of the survey.

TABLE 4. A comparison of number of Wood Storks to number of other wading birds observed.

Date	Number of Wood Storks[1]	Number of other wading birds	Other wading birds/ Wood Storks
Dec 15-21	733	20,875	28.5
Jan 12	246	3,156	12.8
Jan 25-26	407	6,300	15.5
Feb 9	328	5,800	17.7
Feb 23	275	4,130	15.0
Mar 9	390	620	1.6
Mar 26	410	845	2.1
Apr 16-18	440	5,578	12.7
May 2, 3, 5	163[2]	10,383	6.6

[1]Other than at the rookery.
[2]Including approximately 50 seen flying.

Feeding in man-made waters

The highest proportions of Wood Storks feeding in man-made waters were seen near the beginning and the end of the nesting season (Table 5). Few natural feeding areas were suitable for feeding at this time. Higher elevations, which, under natural condi-

TABLE 5. Percentage of feeding Wood Stork bserved in irrigation ditches or other man-made facilities.

Date	Percentage of Total Birds Seen
Dec. 15-21	34
Jan 12	42
Jan 25, 26	27
Feb 9	20
Feb 23	4
Mar 9	3
Mar 26	10
Apr 16-18	17
May 2, 3, 5	38
May 20, 26	9

tions, had been the first areas to dry and provide concentrated fish for the birds, were also the first areas to be farmed or otherwise developed. After the drainage of much of southwest Florida, irrigation ditches became some of the few sources of concentrations of fish early in the dry season. Drainage caused lower elevations, which, under natural conditions, had provided concentrations of fish near the end of the dry season, to dry more quickly; ponded water in drying coastal sections of canals then became some of the few places where Wood Storks could find food. Thus, irrigation ditches and canals substituted for natural areas no longer available at the beginning and end of the dry season. In the middle of the dry season, when ponds in the center of the sloughs were at the ideal stage for Wood Stork feeding, the proportion of total Wood Storks seen feeding in man-made water bodies was much lower.

The common practice of pumping water off fields into adjacent marshes in the fall may promote high densities of fish, which move back into irrigation ditches when water levels in the marshes fall. Drawing irrigation water out of the ditches for application during rainless periods may further increase the fish concentrations.

Although I kept no records on the topic, I had the general impression that Wood Storks favored wetlands in proximity to truck farms and pastures. Runoff of fertilizers or cow manure from these areas into nearby marshes may enhance fish production. No feeding wading birds were seen in northeast Hendry County or other areas of intensive large-scale agriculture and drainage. Wood Storks were not observed in the perimeter ditches around citrus groves. Citrus areas are usually more completely drained and have deeper ditches than truck farms.

Conclusions

Wetlands in five Florida counties contributed to the nesting success of Wood Storks at Corkscrew Swamp Sanctuary during the 1973-74 nesting season. Areas dried at different rates and reached stages useful to Wood Storks at different times, resulting in an uninterrupted supply of food for the rookery through the entire breeding season. A complete loss of feeding habitat during any part of the nesting season could prevent the Wood Stork colony at Corkscrew from producing fledglings.

Upper Corkscrew Swamp, the Okaloacoochee Slough, and the Fahkahatchee Strand may be particularly important feeding areas for the Corkscrew colony because they are near to the rookery and provide concentrated food supplies during the part of the nesting season when the food requirements of the growing young are greatest. These areas have added value to Wood Storks because their ponds are located at different elevations and dry at different times. Its nearness to these major feeding sites may be the attraction of Corkscrew Swamp as a nesting site. A loss of any one of these areas as feeding habitat might reduce the number of birds that the rookery could produce.

My observations suggest that Wood Storks adjusted to an altered habitat and took advantage of new opportunities. The nesting population in 1973-74 was, however, only one third that in the early 1960's (and recent nesting levels have been even lower), possibly reflecting the loss of feeding habitat. It might be possible to increase feeding habitat through a combination of reflooding areas that have been drained but not developed and modifying agricultural structures and practices. Observations from the survey suggest which combinations of natural wetlands and agriculture might be most beneficial to storks.

By locating feeding Wood Storks, I have identified not only which areas contributed to a successful breeding season for the Corkscrew Wood Stork colony but also which areas of southwest Florida still functioned as productive wetlands in 1973-74, despite wide-spread drainage and development. These areas have been located in order that steps might be taken to preserve them—not only because of their importance to the Wood Stork population but also because of the other services that natural wetlands provide.

The significant Wood Stork feeding sites are summarized, by county, in the Appendix. Since the survey was made, one important area, the Fahkahatchee Strand, has become a state preserve. Although the southwestern part of Corkscrew Swamp is owned by the National Audubon Society, the northeastern part is not protected. The Okaloacoochee Slough also is unprotected. The stage regulation schedule implemented at Lake Okeechobee in the late 1970's has reduced the availability of the marshes on the lake's northwestern and western shores as feeding sites for Wood Storks.

Summary

The feeding sites of Wood Storks nesting at Corkscrew Swamp Sanctuary during the dry season of 1973-74 were located by means of an aerial survey. From 10 to 82 Wood Storks per hour of flight were seen during each flying period. The Wood Storks fed in shallow, drying ponded waters in six counties: Collier, Hendry, Glades, Lee, Charlotte, and Okeechobee. The most heavily used areas were northern Corkscrew Marsh and the Okaloacoochee Slough. The marshes on the western and northern rim of Lake Okeechobee were important feeding sites of the birds during the latter part of the nesting season, when most ponded water in the rest of the six-county area had dried. The survey revealed that Wood Storks range at least 97 kilometers (60 miles) from their nesting area to feed.

Acknowledgments

The Wood Stork survey was part of the research conducted under H. T. Odum at the Center for Wetlands, University of Florida, Gainesville, with support from the National Science Foundation and the Rockefeller Foundation. Peter B. Schroeder was my pilot and also assisted in the preparation of the manuscript. The survey was part of my dissertation work in the Department of Environmental Engineering and Sciences, School of Engineering, University of Florida. The National Audubon Society provided information and cooperation in this study.

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Appendix

Feeding areas of Wood Storks in southwest Florida counties during the 1973-1974 breeding season.

Collier County: Corkscrew Swamp, Bird Rookery Strand, Okaloacoochee Slough, East Hensen Marsh, Fahkahatchee Strand, Big Cypress Swamp, Catherine Island Area, Shaggy Cypress, Camp Keais Strand, Baucom Cypress Strand, Rice Straw Strand, Kissimmee Billy Strand, and South Coast Mangroves.

Hendry County: Okaloacoochee Slough (Upper and Lower), Sear-Keri Area, Graham Marsh, Collins Slough, Lime Slough, Hog Cypress, Tussell Slough, and Kissimmee Billy Strand.

Glades County: Fisheating Creek, Jack's Branch, Chaparral Slough, and Lake Okeechobee Marshes (west of Observation Island, Moonshine Bay, and mouth of Indian Priarie Canal).

Okeechobee County: Lake Okeechobee Marshes (King's Bar and Northeast Marsh).

Charlotte County: Telegraph Swamp.

Lee County: South Central Marshes (2) and Six Mile Cypress.

NOTES

A leucistic Eastern Phoebe in Alachua County, Florida—Leucism in birds is a frequently observed phenomenon (Wallace and Mahan 1975, An introduction to ornithology, New York, MacMillan Publishing Co.). According to Gross (1965, Bird-Banding 36:67-71), leucism or albinism has occurred in 304 species and 54 families of North American birds. Gross (1965) used the term "albinism" but stated that only about 7 percent of 1847 cases reported were actually true albinos. Deane (1876, Bull. Nuttall Ornith. Club 1:20-24) suggested however that ". . . among the Tyrannidae few examples have been detected . . ." Gross (1965) found examples of leucism in 11 species (30 individuals) among the tyrant flycatchers but did not provide species' names. Based on a literature review and correspondence (W. E. Lanyon pers. comm.), leucism in the Eastern Phoebe (*Sayornis phoebe*) apparently has been reported only once (Hostetter 1934, Auk 51:524). A leucistic Eastern phoebe in Alachua County, Florida therefore, seems noteworthy.

Fig. 1. Leucistic Eastern Phoebe photographed in Alachua County, Florida.

The bird was first observed on the south side of Paynes Prairie State Preserve, near U.S. Highway 441 on 14 December 1983. We regularly saw this bird through 3 March 1984 foraging from or perched in scattered sugarberry (*Celtis laevigata*) and live oak (*Quercus virginiana*) or a patch of bladderpod

(*Glottidium vesicarium*) stubble. Occasionally the bird was seen in the company of a normally-plumaged phoebe. We detected no behavioral differences between the two. The bird's remiges, rectrices, belly, and top of the head were ivory white, whereas the remainder of the bird's plumage was a pale creamy olive (Fig. 1). The eyes and all flesh parts were normally pigmented. It is interesting that Hostetter's (1934) description of a leucistic nestling Eastern Phoebe is identical to our observations except that the nestling's feet were light-colored. —**Anne Shapiro Wenner, David S. Maehr, and Stephen A. Nesbitt,** Florida Game and Fresh Water Fish Commission, Wildlife Research Laboratory, 4005 South Main Street, Gainesville, Florida 32601.

Florida Field Naturalist 12: 97-98, 1984.

Some avian predators of the round-tailed muskrat.—The round-tailed muskrat (*Neofiber alleni*) is found only in Florida and extreme southeastern Georgia and is one of the region's most poorly known rodents, one reason for its designation as a "Species of Special Concern" in Florida (Tilmant 1978). Very little is known about predation on round-tailed muskrats or their role in marsh food chains. In this note I present some observations on muskrat predators.

On April 12 1973, F. F. Snelson, H. C. Sweet and I observed an adult Great Blue Heron (*Ardea herodius*) on a canal bank on the north side of NASA Parkway West, 0.5 km west of the Kennedy Space Center Visitor Center, Brevard County, Florida. The bird was attempting to swallow a round-tailed muskrat. As we approached, it flew several hundred meters with its prey, three times. Each time it alighted, it picked up and dropped the rodent several times and attempted to swallow it by tossing it aloft. We were finally able to frighten the bird away from its catch and collect the specimen. It was a 230 g young adult female and is now in the mammal collection at the University of Central Florida (UCF M546).

During a brief investigation of *Neofiber* populations at Merritt Island National Wildlife Refuge in 1972, I was puzzled by the discovery, on many occasions, of *Neofiber* skeletal parts (upper skulls, jaw rami, teeth, etc.) lying on top of their nests. Later I found freshly regurgitated owl pellets that consisted of a well-cleaned *Neofiber* skull completely wrapped in a bundle of *Neofiber* hair. My earlier observations were probably of weathered pellets, consisting only of skeletal parts. The owls were probably Barred Owls (*Strix varia*), judging by the size of the pellets and the frequent sightings of that species in the area. Barn Owls (*Tyto alba*) and Great Horned Owls (*Bubo virginianus*) also prey on round-tailed muskrats (Birkenholz, 1963) and Lefebvre (1982) found two owl pellets containing *Neofiber* skulls and other skeletal parts.

The first record of predation of round-tailed muskrats by Great Blue Herons was reported by Howell (1932), who noted that in 1885 C. J. Maynard saw a heron carrying a rat in its bill, on the Indian River. Collecting the rodent after firing a shot at the heron, he found it to be the second specimen of *Neofiber alleni* collected to that time. Other known avian predators of *Neofiber* include Marsh Hawks (*Circus cyaneus*) (Birkenholz 1963) and Bald Eagles (*Haliaeetus leucocephalus*) (McEwan and Hirth 1980). Lefebvre (1982) sug-

gested that Burrowing Owls (*Athene cunicularia*) and Great Egrets (*Casmerodius albus*) may also feed on them, but presently, verified avian predators of round-tailed muskrats include only three owls, the Marsh Hawk, Bald Eagle and Great Blue Heron.

This is contribution 36, Merritt Island Ecosystems Studies.

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Florida Field Naturalist 12: 98-99, 1984.

Some comments about "white-winged" gulls in Florida.—Several species of gulls in Florida may be nearly white in certain plumages. Two of these, the Glaucous Gull (*Larus hyperboreus*) and the Iceland Gull (*L. glaucoides*), are very similar in plumage at the same age, and their first-year plumages can resemble paler examples of Thayer's Gull (*L. thayeri*). Also the problem may be compounded by occasional albinism in other species of gulls (Atherton and Atherton 1981, Anon. 1972).

Through the spring of 1977, Florida records of about 45 Glaucous Gulls and 27 Iceland Gulls had been published in Audubon Field Notes, American Birds, and Florida Naturalist. None of these gulls was reported to have been older than two years. We believe from our review of specimens and photographs that many of the birds thought to be Iceland Gulls were misidentified, and that Glaucous Gulls are by far more frequently encountered. For example, a "score of records" of Glaucous Gulls in Brevard County (Cruickshank 1980) implies that many other records of this species have not been published. In this paper we review existing records and identification criteria.

Specimens. A reported Iceland Gull (Cunningham 1965) collected by H. L. Stoddard, Sr., at St. Augustine (St. Johns Co.), 28 October 1964 (TTRS 358), proved to be an almost pure-white Ring-billed Gull (*L. delawarensis*) showing a faint bar on the bill (Stevenson 1972). A gull collected by Lovett Williams, Jr., on a spoil island off Port St. Joe (Gulf Co.), 19 August 1971 (FSM 15778),

being intermediate in some characteristics between Glaucous and Iceland, was identified as an Iceland Gull by some, but was called a Glaucous Gull by Kenneth Parkes and us. Because of bill measurements and color, we also consider an "Iceland" Gull collected by Frank Ligas at Fort Lauderdale (Broward Co.), 11 April 1962 (UMRC 4797; Paulson and Stevenson 1962) to be a Glaucous Gull. A Glaucous Gull collected by Stevenson near Flagler Beach (Flagler Co.), 18 March 1961, had been called an Iceland Gull by local observers (TTRS 3147, identification by Wetmore; Stevenson 1961). Additional specimens of Glaucous Gulls were collected by J. M. Stevenson at Mayport (Duval Co.), 2 March 1974 (FSU, not catalogued; Stevenson 1974) and by H. M. Stevenson near Eastpoint (Franklin Co.), 17 May 1978 (TTRS 3597; Kale 1978). If all these identifications are correct, as we believe, Florida has only one specimen of the Iceland Gull—the bird reported by Howell (1932) from Crystal River (Citrus Co.), 9 February 1927 (FSM 2103). In contrast, five specimens of Glaucous Gulls in Florida have been examined.

Photographs. A published photograph of a putative Iceland Gull, like some Florida specimens, may have been misidentified. This bird remained on the Florida Keys from January 1950 to 30 May 1952. The published photograph (Cruickshank 1951), however, shows a bill that is entirely pale and quite large, although somewhat out of focus. The only undisputed photographs of Iceland Gulls were taken of single birds in first basic plumage at Port Canaveral, 8 February 1975 (TTRS P183), and Toytown Landfill, Pinellas County, 4 February 1978 (TTRS P371). By contrast, at least eight different Glaucous Gulls have been photographed in Florida, although we have not examined every photograph. The first of these was reported by Howell (1932), who, along with H. C. Oberholser, viewed the cinefilm and corroborated the identification. We examined the following photographs of Glaucous Gulls: Port Canaveral, 22 December 1958 (TTRS P52) and 10 February 1961 (TTRS P53); approximately 32 km east of Cape Canaveral, 9 January 1977 (TTRS P373); Sebastian Inlet, 21 February 1978 (TTRS P180); and Toytown Landfill, 9 March 1981 (TTRS P374). We have not had an opportunity to examine photographs taken at Pensacola (Escambia Co.) in the spring of 1936 (Weston 1936) and in the winter of 1959-60 (F. M. Weston et al., *in* James 1960).

Identification. Probably the most important criteria in distinguishing Glaucous and Iceland gulls are color and size of the bill. In four sources (Ridgway 1919, Forbush 1925, Godfrey 1966, and Dwight 1925), the longest exposed culmen in the Iceland was 47 mm, shortest for the Glaucous 49 (max. 67) (Table 1). The Iceland Gull's bill is also more slender, so that the difference in overall bill size is usually noticeable in the field. The bill color of a first-year Kumlien's Iceland Gull (*L. g. kumlieni*), the predominant wintering race in North America (Heil 1983, Gosselin and David 1983), is usually entirely dark but shows a horn or gray color at the base in its second year. Until at least two years old, the Glaucous Gull's bill is flesh-colored with the distal one-third dark. Because the wing is relatively longer in the Iceland Gull than in the Glaucous, the bill/wing ratio should separate nearly all individuals. When the ratio of the exposed culmen to the wing arc was measured in specimens of known identity, the following results were obtained: Glaucous, TTRS 3147, 0.127; TTRS 3597, 0.138; FSM 15778, *ca.* 0.132 (tips of primaries frayed). UMRC 4797 matched these ratios well, with 0.137. Iceland Gulls had much lower ratios: TTRS 3211,

TABLE 1. Bill and wing lengths of Glaucous and Iceland gulls.

Source	Bill (exposed culmen) (mm)		Wing (arc) (mm)	
	Glaucous	Iceland	Glaucous	Iceland
Ridgway (1919)	49-67	40.5, 44.5[1]	424-474	379, 394[1]
Forbush (1925)	54-76	40-47	425-475	374-432
Godfrey (1966)	53.0-64.6[2]	43-47	447-477	395.5-423
Dwight (1925)	56-67	39-45	430-477	378-433

[1]Only two specimens
[2]Males only

0.102; FSM 2103, 0.115 (primaries frayed); USNM 394270, 0.0955; USNM 76230, 0.0907. This criterion would fail to provide a correct identification only in the highly unlikely circumstances that an Iceland Gull had a bill that was very long relative to a very short wing, or a Glaucous Gull had a bill that was very short relative to very long wing.

The problems of correctly identifying Iceland Gulls were further complicated when the occurrence of Thayer's Gull in Florida was suspected. The identifications of at least seven yearling Thayer's Gulls photographed at Toytown Landfill (1979-81) were confirmed by J. Jehl and Guy McCaskie (all photos on file at TTRS). The plumage colors of at least two of these, TTRS P359 and P368, were in the range of *kumlieni*. However, the former was as large as some Herring Gulls (*L. argentatus*) with which it mingled, and the latter, observed from late March through mid-April, appeared exceptionally pale owing to feather wear. Because ranges of both body and bill size overlap in Iceland and Thayer's gulls and their bill color is virtually identical in the first year, a positive identification in the field is sometimes impossible. However, the combination of the color pattern of the individual back and scapular feathers, along with the color of the primaries, is usually diagnostic in *unworn* first basic plumage. The back and scapular feathers are brownish or tan in Thayer's, edged with pale buff to white. In contrast, those of the Iceland are whitish to pale buff with narrow brownish barring. The primaries of Thayer's average darker in tone than those of the Iceland and approach those of the Herring Gull.

On 13 June 1983 at Port St. Joe (Gulf Co.), Atherton tentatively identified as Thayer's a very pale-winged gull standing adjacent to several noticeably larger Herring Gulls in first alternate plumage. However, extreme abrasion and bleaching of the wing and tail feathers prevented elimination of Iceland as a possibility. The bird was collected the following day, and when the specimen was prepared and measured we were able positively to identify it as a female Thayer's Gull (TTRS 3724, confirmed by Earl Godfrey), the only Florida specimen. Measurements include bill from naris 19.8 mm, exposed culmen 43.1, wing (arc) 375, and tarsus 57.0.

Only since the mid-1970's have the immature plumages of Thayer's Gull been adequately described, and the species' status in the eastern United States has become known even more recently. Therefore, it is likely that some Thayer's Gulls have been misidentified as "Iceland" Gulls. Burt Monroe, Jr., one of the observers of the Pensacola "Iceland" Gull (Weston 1960), commented to Atherton (*in litt.* 1982) that he now believes the gull "could very well have been Thayer's." In fact, the difficulty of distinguishing the two forms by overall size, lengths of body parts, and color pattern may suggest that they are more closely related than they are commonly thought to be. Salomonsen (1951) and, especially, Macpherson (1961) have suggested that the Iceland Gull (*Larus g. glaucoides* and *L. g. kumlieni*) and Thayer's Gull (*L. thayeri*) constitute a single, polymorphic species.

Acknowledgements. We wish to thank Robert L. Crawford for preparation of the Thayer's Gull collected at Port St. Joe and Earl Godfrey for examining the specimen and confirming our identifications of both it and the Iceland Gull photographs. We also thank Joseph Jehl and Guy McCaskie for identifying photographs of *L. thayeri* and curators in the following museums for use of specimens under their care: Florida State Museum (FSM), Florida State University (FSU), Tall Timbers Research Station (TTRS), University of Miami Research Collection (UMRC), and the National Museum of Natural Science (USNM).

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Florida Field Naturalist 12: 99-103, 1984.

American Crows feeding on and storing river otter dung.—I observed forty instances of American Crows taking the dung of river otter (*Lutra canadensis*) at the Hendrie ranch, 24 km south of Lake Placid, Highlands County, Florida, between 30 January and 19 February 1984. The crows were tame owing to years of protection, and, at distances of 10-14 m using 8 x 40 binoculars, I was able to watch them and three otters that I believed to be juveniles. Two adult otters were present on 18 February. All of my watching was along a stream that ran through open pasture and at a large culvert that provided a refuge for the otter.

The otters used three defectation or marking sites (Melquist and Hornocker 1983) repeatedly. The crows were quick to recognize what an otter was doing and flew down (n=29) to start eating the usually small and mushy scats when the otter left. In nine instances the crows visited defecation sites in an absence of otters. The crows either ate the feces directly (n=25) or loaded it in their bills and walked or flew to store it (n=13) elsewhere. In most of my observations of storing (n=9), the crows stored feces 3-7 m away in a clump of grass, covering it over with small wads of turf or other debris. In one instance otter dung was poked under a "cow pie" and, in another, was flown to a bay tree (*Persea* sp.) and pushed into a bromeliad.

I collected samples of fresh dung on 6 February. These, as kindly examined by James N. Layne, were found to consist almost entirely of well-fragmented remains of crayfish (*Procambarus* sp.) held together with mucous. Other than the mucous, it was difficult to perceive what the nutritive value of the scats might be. Crows eat sand (Kilham 1984), and sharp-edged pieces of *Procambarus* exoskeletons might serve the same purpose in their gizzards. In that the crows at the ranch stored food of many types (Kilham 1984), the caching of scats, in the same ways, did not seem unusual. I have described other relations of the American Crows and otter elsewhere (Kilham 1982).

Other birds reported to eat the dung of mammals include: the Common Raven (*C. corax*) (Bent 1946); the Black-billed Magpie (*Pica pica*) (Summers-Smith 1983); the Starling (*Sturnus vulgaris*) (Simmons 1983) and the Black Vulture (*Coragyps attratus*) (Welty 1982) all eating dog feces; and the Ivory Gull (*Pagophila eburnea*) (Welty 1982), eating the feces of polar bear, walrus, and seals.

I thank James N. Layne and Fred Lohrer for help of various kinds while we were staying at the Archbold Biological Station and James H. Hendrie for permitting my wife and I to visit his ranch.

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Lawrence Kilham, Main Street, Lyme, New Hampshire 03768.

Florida Field Naturalist 12: 103-104, 1984.

Sighting of an American crocodile at Collier-Seminole State Park, Florida. —On November 23, 1983, I was in Collier-Seminole State Park, Collier County, Florida, canoeing the Blackwater River which meanders several kilometers through a mangrove forest. I was accompanied by Lt. Bob Rahberg and Rangers Pete Brockman and Hazel Padgett of the Florida Park Service. The tide was low as we rounded a bend at 1030 and we saw an American Crocodile (*Crocodylus acutus*) sprawled full length on a sandbar. The animal was approximately 2.5 meters long. It offered a broadside view for several minutes with the sun behind us. The crocodile showed no fear as we slowly drifted by within 10 meters of it. The greenish-gray color, tapered snout, and prominent lower tooth were clearly visible. As we watched, the crocodile slowly opened its mouth, holding it open. On the return trip at 1045, we saw the reptile at the same location; this time with an alligator sunning nearby. The alligator went into the water as we approached. When our canoe trip ended, Rahberg, Brockman and I returned to the site by motorboat with our cameras. The crocodile had moved to another sandbar nearby where it lay at the water's edge (Fig. 1). We photographed it for approximately ten minutes and approached to within five meters before it slipped into the water and swam away.

Paul Moler of the Florida Game and Freshwater Fish Commission viewed the slides that were taken of the animal. He identified the animal as a crocodile (*Crocodylus acutus*).

Moore (1953, Copeia 1953: 54-59) concluded that there is no evidence that the American Crocodile occurs naturally on the west coast. However, LeBuff (1957, Herpetologica 3:25-78) provided second-hand reports of sightings and concluded that the crocodile occurs sparsely along the west coast. Kushlan and Mazzotti (in prep.) reported that crocodiles are infrequently, but regularly, observed along the west Florida coast including Naples, Collier County; Sanibel, Lee County and Osprey, Sarasota County. They reported several sightings near Collier-Seminole State Park, including one in 1980. Others were reported from Monroe County in Hurdles Creek, Turner River near Everglades City, and in Broad River.

Kushlan and Mazzotti (in prep.) concluded that the southwest Florida coast is part of the overall range of the crocodile in Florida, but not a part of

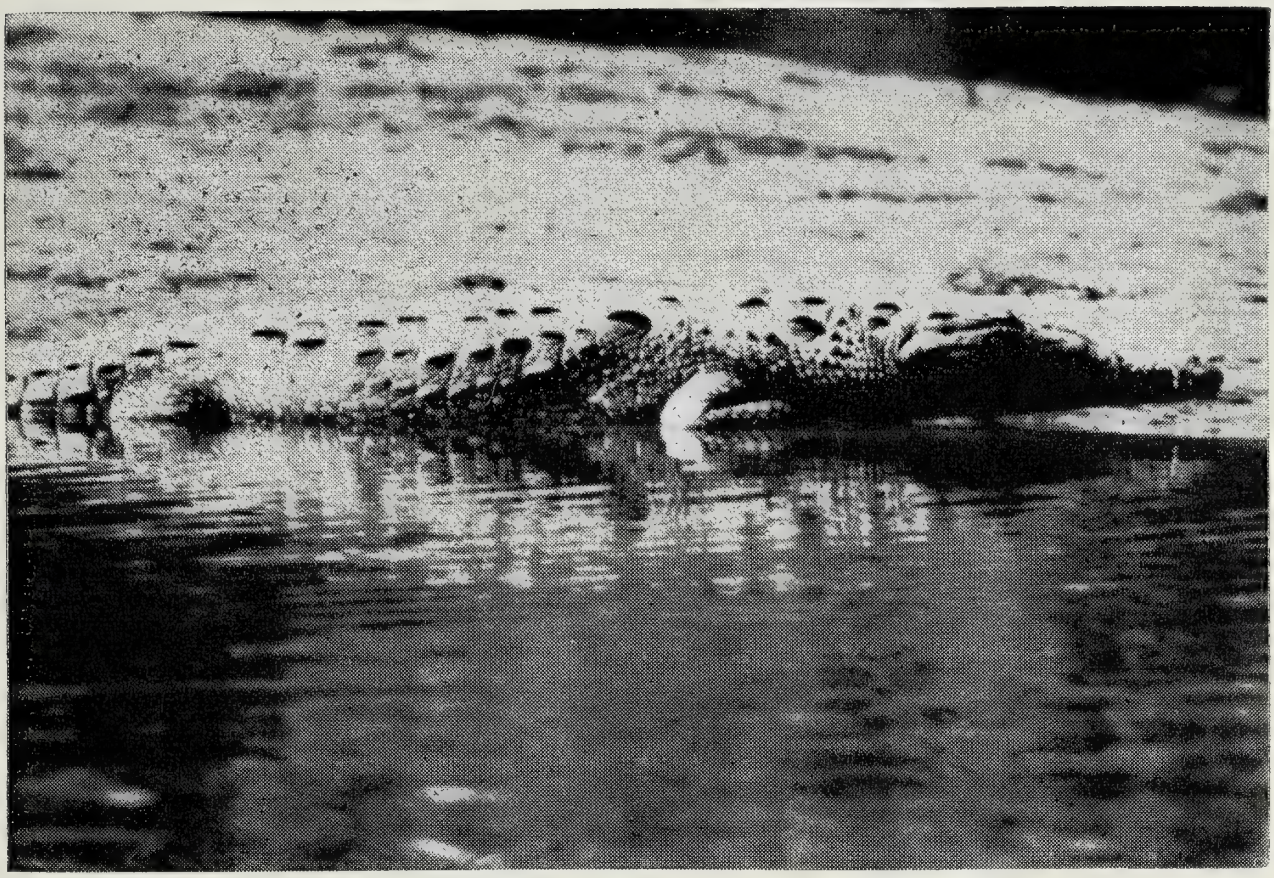

Fig. 1. American crocodile photographed in Collier County, Florida.

the breeding range. Our sighting suggests that observers should be aware of the possible occurence, and need for documentation of crocodiles along the west coast of Florida.—**Kenneth C. Alvarez**, Florida Park Service, P.O. Box 398, Osprey, Florida, 33559.

Florida Field Naturalist 12: 104-105, 1984.

Three unusual waterfowl in north Florida phosphate mines.—Phosphate mining in Hamilton County, Florida, during the past decade has greatly increased the non-forested wetlands available to wildlife, and waterfowl are conspicuous components of these artificially created wetlands (Montalbano et al. 1978, King et al. 1980, Maehr 1980, Schnoes and Humphrey 1980). These habitats now cover over 1300 ha in north Florida. In addition to the expected wetland birds, several unusual waterfowl species have been observed at Occidental Chemical Company's Suwannee River and Swift Creek mines, located 12 km north of White Springs, Florida (Stafford 1979, Maehr 1981). We report in this note on the occurrence of the White-winged Scoter (*Melanitta fusca*), Oldsquaw (*Clangula hyemalis*), and Cinnamon Teal (*Anas cyanoptera*) from this northernmost Florida phosphate mine.

The White-winged Scoter can only be expected as an occasional wanderer in Florida (Sprunt 1954:83). It is primarily reported along both coasts in pairs or as single birds with concentrations along the northeast coast and Gulf coast south of Tallahassee (Robertson 1971). On 5 November 1979, an adult male White-winged Scoter was observed by R. Repenning and B. Barbour near shore in a settling pond, which was primarily open water. The bird submerged and resurfaced about 30 m away where it was observed for several minutes.

Three adult female White-winged Scoters were shot by hunters on 29 November 1980, 6 December 1980, and 11 January 1984 and identified at the Florida Game and Fresh Water Fish Commission waterfowl check station at Occidental's Suwannee River Mine. Other inland records include: "below Oldtown" (Dixie County) on 20 October 1917, Lake Dora (Lake County) on 2 March 1952 (Sprunt 1954:83); Paynes Prairie (Alachua County) on 25 October 1958 (D. E. Birkenholz *in* Stevenson 1959); Lakeland (Polk County) 22 November 1970 (J. B. Edscorn, G. J. Horel, and W. P. Johnson *in* Robertson 1971); and 7-23 December 1972 (P. J. Fellers and J. B. Edscorn *in* Woolfenden 1973).

Oldsquaws appear to have become regular winter visitors at Occidental. In addition to Stafford's (1979) record, undocumented sightings have occurred every year since 1977 by Florida Game and Fresh Water Fish Commission personnel. Most recently, a male and female Oldsquaw were seen on 12 January 1984 in an open-water settling pond at Occidental.

The western-breeding Cinnamon Teal is an infrequent winter visitor east of the Mississippi River (Sprunt 1954:71). Two adult male Cinnamon Teal were harvested by hunters at Occidental on 2 December 1981 and 23 November 1983. Both birds were using settling ponds characterized by patches of open water and cattail (*Typha* sp.). Other inland records for Florida include Lake Iamonia (Leon County) on 18 February 1893, Lake Jackson (Leon County) on 17 November 1906, Shell Hammock (Polk County) on 1 December 1951 (Sprunt 1954:72), near Corkscrew Swamp (Collier County) on 26 December 1976 (J. Hansen and L. Riopelle *in* Stevenson 1976), and Myakka River State Park (Sarasota County) on 22 December 1981 (L. Atherton, Helen Dowling, and William Dowling et al. *in* Stevenson 1982).

The occurrence of two individuals of this rare Florida species from a single locality is noteworthy, especially because harvest records may represent only a portion of the total number of Cinnamon Teal using this area. Further, the opportunity for observing waterfowl is reduced due to difficult travel in and around phosphate mines, and often their restricted access.

Continued occurrences of Oldsquaws and new records for White-winged Scoters at Occidental support the suggestion that a cross-peninsula travel route between the Gulf of Mexico and the Atlantic Ocean may exist for some of these sea ducks (Robertson 1971). Further, the multiple inland sightings of all three species mentioned herein suggest that their occurrence may not be accidental. The creation of artificial wetlands associated with phosphate mining in Hamilton County has apparently provided habitat for these birds. If so, Occidental's settling areas will likely continue to produce unusual sightings. However, the physical nature of phosphate-mine settling ponds and associated vegetation is strictly temporary. Altered water levels can easily convert once productive waterfowl wintering habitat to little-used willow swamps. A special effort should be made by those visiting phosphate mines to document unusual waterfowl species.

We thank H. M. Stevenson for help with recent waterfowl records.

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Stevenson, H. M. 1982. Florida region. Am. Birds 35: 286-289.

Woolfenden, G. E. 1973. Florida region. Am. Birds 27: 603-607.

David S. Maehr, Florida Game & Fresh Water Fish Commission, Wildlife Research Laboratory 4005 S. Main St., Gainesville, Florida 32601, **Robert W. Repenning**, Cooperative Fish and Wildlife Research Unit, 117 Newins-Ziegler Hall, University of Florida, Gainesville, Florida 32611, **H. Dick Couch, Jr.**, Florida Game & Fresh Water Fish Commission, Route 7, Box 102, Lake City, Florida 32055.

Florida Field Naturalist 12: 105-107, 1984.

REVIEW

Estimating numbers of terrestrial birds.—Studies in Avian Biology Number 6. C. John Ralph and J. Michael Scott (Editors). x + 630 pp., 1981. $20.00. Published by the Cooper Ornithological Society. Send orders to Allen Press, Inc., P.O. Box 368, Lawrence, Kansas 66044.—Subtitled "The proceedings of an international symposium held at Asilomar, California, October 26-31, 1980," this publication, containing citations to more than 1400 scientific papers, is an excellent summary of current research on avian censusing techniques. Fifteen state, national, and international organizations served as sponsors for the meeting, which was attended by approximately 400 people from around the world. The symposium drew so much interest because avian censusing is an important tool used by scientists, biological consultants, and amateurs to address questions related to bird population fluctations, interspecific interactions, long-term population changes, and land management techniques. More technical reviews of this volume will be available to scientists, therefore I will assess the books' value for amateurs and comment on bird censusing efforts in Florida.

The Proceedings consists of 82 papers in nine sections. Section topics are: estimating relative abundance and density, comparing census methods, sources of bias, sampling design, and data analysis. Each section opens with introductory remarks by the section chairperson and ends with a summary/critique.

John Emlen's Table 1 (Bird census problems and methods) in the "Summary of the symposium" matches objectives of typical bird community studies with available methods and examples. Appendix I is a glossary of avian censusing terms by Ralph, and Appendices II through VI are reports of committees formed during the conference. Harry Recher's report on the need for standardized census methods and Jared Verner's report on future research needs are especially informative. A strong emphasis was placed throughout the conference on gaining comments from statisticians to improve census design, procedure, and analysis.

Bird-sampling techniques most frequently discussed in the Proceedings are mark-recapture sampling, line (or transect) counts, point counts, and spot-mapping. Amateur contributions to ornithological research frequently occur as part of large-scale projects. The National Audubon Society supports the Breeding Bird Census (BBC), Winter Bird-Population Study (WBPS), and Christmas Bird Count (CBC); the U.S. Fish and Wildlife Service runs annual Breeding Bird Surveys (BBS); and breeding bird atlas projects are organized on a state-by-state basis. All of these data sources depend on volunteer participation. It is important for contributors to these projects to become aware of advances in bird sampling techniques. For example, adherence to guidelines on census plot size and the number of census trips strengthens comparability of censuses between habitats and years and will increase scientific value of the enormous time and energy devoted to counting birds.

The BBC and WBPS are based on the spot-map method in which detections of singing males are marked on maps of a rectangular gridded census plot during 8 or more census trips. Emlen, in his closing remarks (p. 576), notes that density-measurement censuses such as the BBC and WBPS are "laborious, costly, and limited in applicability," but goes on to say, "They are producing much valuable information . . . and must be promoted for the present as the best we have been able to devise." From 1947 to 1982, 33 BBCs and 37 WBPSs have been completed in Florida. Many important habitats in the state have been censused, but very few censuses have been continued over years in both winter and breeding seasons. Long-term census continuity is a valuable asset for evaluations of between-year variability. Factors frequently influencing accuracy of spot-map censuses are plot area, observer variability, edge effect, censusing speed and grid size. All of these are discussed in the Proceedings.

Over 1400 people in 40 counts participated in the 1979 CBC in Florida (1980, Amer. Birds 34). While the CBC involves the greatest amount of amateur participation each year in the United States, it is also the most difficult to manage for scientific purposes. Arbib (pp. 30-33) made several suggestions to improve CBC data collection and presentation including greater refinement of habitat analysis and improving numerical estimation of flocks through training sessions. Schreiber (pg. 60) added that CBCs can be made more biologically useful through greater emphasis on counting common birds and recording sex-age data.

The U.S. Fish and Wildlife Service BBS is an automobile survey conducted over a 25-mile route with 3-minute stops every half-mile. Approximately 2000 randomly located roadside routes are surveyed annually throughout North America. Already well-standardized, the BBS involves a limited number of people each year with only 38 routes in Florida.

Florida's breeding bird atlas project is still in the planning stage with Dr. Herbert Kale, II, as state organizer. Its goal is to define the breeding ranges of bird species in Florida. Randomly selected locations throughout the state will be surveyed. This will potentially involve a large number of people over several years. M. Udvardy organized the North American Ornithological Atlas Committee at the Asilomar Conference to encourage atlas projects in as many states and provinces of Canada, Mexico, and USA as possible. Laughlin et al. (1982, Amer. Birds 36: 6-19) provide an overview of bird atlas projects in the United States.

Of the five avian censusing projects discussed that involve amateur participation, the CBC, BBC, and WBPS could benefit the most from technical improvement. Coupled with vegetation data, the BBC and WBPS can be excellent sources of data on bird-habitat relations and interspecific interactions. Improvements in the quality of these data can be made by more rigorous adherence to standards already established by the International Bird Censusing Committee. With immense human population growth projected for Florida over the next 20 years, solid baseline data on bird populations in many habitats is invaluable for detecting any deleterious impact of this growth.

"Estimating numbers of terrestrial birds" is a watershed volume encompassing many refinements of censusing techniques and statistical treatment of data. Although many amateurs may find it too technical, consulting the Proceedings for up-to-date work on censusing problems and revised methods is profitable for anyone interested in scientific bird censusing. Expansion of improved bird censusing efforts such as the BBC and WBPS is needed in Florida. I hope that interested birders around the state will consult this tremendous source of material and get on with the business of counting birds.

Thanks to Frances C. James and Robert L. Crawford for their comments on this review.—**R. Todd Engstrom,** Department of Biological Sciences, Florida State University, Tallahassee, Florida 32306.

Florida Field Naturalist 12: 107-109, 1984.

EDITORIAL

Acknowledgments.—I greatly appreciate the many people who generously contributed to the publication of Volume 12 of the Florida Field Naturalist. I especially thank those who donated their time and talent in reviewing submitted papers: Lyn Atherton, Wes Biggs, Maggie Bowman, Joan A. Browder, Paul Buckley, Gloria Caldwell, Roger Clapp, George A. Clark, Jr., Mary H. Clench, John Ewel, Millicant S. Ficken, Paula C. Frohring, Wally George, John William Hardy, Jack P. Hailman, Wayne Hoffman, Nicholas R. Holler, Stephan R. Humphrey, Lawrence Kilham, Wesley E. Lanyon, James N. Layne, Julian C. Lee, Fred E. Lohrer, David S. Maehr, Larry L. McNease, Peter Merritt, Frank C. Montalbano, III, Steven Patton, William B. Robertson, Jr., James A. Rodgers, Ralph W. Schreiber, Henry M. Stevenson, Paul W. Sykes, Nicolaas A. M. Verbeck, James T. Tilmant, Lawrence Walkinshaw, Lovett E. Williams, and Glen E. Woolfenden. I also thank Associate Editor Fred Lohrer, for his innumerable contributions, and Jack Hailman, for his generous advice, as well as Elaine Gentile, Caroline Coleman, and Marsha Winegarner. —**James A. Kushlan,** Department of Biology, University of Miami, Coral Gables, Florida 33124.

Florida Field Naturalist 12: 109, 1984.

FLORIDA BIRDS IN THE PERIODICAL LITERATURE

FRED E. LOHRER

Archbold Biological Station, Venus, Florida, 33960.

This list contains 98 citations to recent (1981-83) articles about Florida birds and includes articles from four symposia. Authors are encouraged to send reprints of their articles to the Associate Editor for reviews for inclusion in this annual feature.

ALEXANDER, W. C. 1983. Differential sex distributions of wintering diving ducks (Aythyini) in North America. Amer. Birds 37: 26-29.—Based on 1977 and 1978 Christmas Bird Count data. Florida is an area of major concentrations for Lesser Scaup, Canvasback, and Ruddy Duck with males wintering farther north than females for the latter two species.

ANTONIO, F. B., AND J. ELLIS. 1981. History and current status of the Dusky Seaside Sparrow (with notes on the reproductive biology of Scott's Seaside Sparrow). Amer. Assoc. Zool. Parks Aquariums Regional Conf. 1981, pp. 57-66.

ATKINSON, C. T., E. S. GREINER, AND D. J. FORRESTER. 1983. Experimental vectors of *Haemoproteus meleagridis* Levin from Wild Turkeys in Florida. J. Wildl. Dis. 19: 366-368.—At Paynes Prairie this blood parasite was transmitted from Wild Turkeys to captive domestic turkeys by several species of sand flies (Culicoides).

BECKER, J. J. 1983. Fossil birds of Florida. The Plaster Jacket, No. 42: 5-21. —Provides a general overview plus a selected bibliography.

BEISSINGER, S. R., A. SPRUNT, IV, AND R. CHANDLER. 1983. Notes on the Snail (Everglade) Kite in Cuba. Amer. Birds 37: 262-265.—Includes a background discussion of Florida movements.

BIDERMAN, J. O. 1983. Food for flight. Audubon 85(3): 112-119.—The migration of the Red Knot with information and photos from Florida's Gulf coast.

BLACK, B. B., AND L. D. HARRIS. 1983. Feeding habitat of Black Skimmers wintering on the Florida Gulf coast. Wilson Bull. 95: 404-415.—At Levy Co., Cedar Key, and Franklin Co., St. Vincent NWR.

BLUS, L. J. 1982. Further interpretation of the relation of organochlorine residues in Brown Pelican eggs to reproductive success. Environ. Pollut. Ser. A. Ecol. Biol. 28: 15-33.—The Brown Pelican in the U.S., and presumably in Florida.

BRECK, C. W. 1983. Keys hawk watch volunteers needed. Fla. Nat. 56(3): 2, 14.—Contains data on total number of hawk species seen at 5 Florida hawk watch sites, 1978-82.

BUCKALEW, J. H. 1982. The Laughing Gull on the eastern shores of Maryland and Virginia. N. Amer. Bird Bander 7: 155.—Of 30,000 Laughing Gulls banded by Buckalew in Delmarvia over a 47-year period, 314 were recovered. The map indicates 40 of these were from Florida.

Burger, J., and M. Gochfeld. 1983. Behavior of nine avian species at a Florida garbage dump. Colonial Waterbirds 6: 54-63.—Mid-February, 1980, Deerfield Beach, Broward Co.; Cattle Egrets, Turkey Vultures, three gulls, starlings, three icterids, but no crows.

Carey, C., E. L. Thompson, C. M. Vleck, and F. C. James. 1982. Avian incubation over an altitudinal gradient: incubation period, hatching mass, and embryonic consumption. Auk 99: 710-718.—For Red-winged Blackbirds. Sample includes nesting parameters from Tallahassee, Leon Co.

Carter, R. M. 1983. Owls, Burrowing (Mayo, Florida). Birding 15: 212(c). —An update of a birding site guide first published in 1980.

Clancy, J. J. 1982. Budgerigar, Indian Rock Beach, Florida. Birding 14: 212(a).—a birding site guide.

Clapp, R. B., D. Morgan-Jones, and R. C. Banks. 1983. Marine birds of the southeastern United States and Gulf of Mexico. Part III. Charadriiformes. U.S. Fish Wildl. Serv., Off. Biol. Serv., FWS/OBS-83/30, 853 pp.—Includes 2 phalaropes, 6 gulls, 13 terns, and *Rhynchops*. Same style and format as Part I & II (*Fla. Field Nat.* 11: 49, 1983). A remarkable compendium of all available information on these birds and an indispensible reference.

Cox, J. A. 1983. Bartram's bird, the Florida Scrub Jay. Fla. Nat. 56 (2): 7-10.

Crawford, R. L., S. L. Olson, and W. K. Taylor. 1983. Winter distribution of subspecies of Clapper Rails (*Rallus longirostris*) in Florida with evidence for long-distance and overland movements. Auk 100: 198-200.

Duncan, L. 1983. Atlantic Flyway review: Region V. Gulf Breeze. FL 302-0871. N. Amer. Bird Bander 8: 35.—Brief report on fall 1981 banding.

Forrester, D. J., et al. 1983. Ecology of helminth parasitism of Mourning Doves in Florida. Proc. Helminthol. Soc. Wash. 50: 143-152.—Based on examination of 455 doves from 8 Florida localities (1973-78).

Geanangel, C. 1983. Seasonal abundance of the Bald Eagle in Lake Kissimmee State Park, Central Florida. Lake Region Naturalist 20: 15-16.—Polk Co.

Gerrard, J. M. 1983. A review of the current status of Bald Eagles in North America. Pp. 5-21 *in* Bird, D. M. (Ed.). Biology and management of Bald Eagles and Ospreys.—Based on analysis of Christmas Bird Count data including Florida where eagle members are estimated to be 1/3 to 1/2 of the population 25 years ago.

Gochfeld, M. 1983. The Roseate Tern: World distribution and status of a threatened species. Biol. Conserv. 25: 103-125.

Halkin, S. L. 1983. Resting birds tuck bills toward outside of group. Auk 100: 997-998.—Black Skimmers and Black-necked Stilts at Everglades National Park.

Hardy, K. I., and G. E. Probasco. 1983. The habitat characteristics and life requirements of Bachman's Sparrow. Birding 15: 189-197.—Literature survey. lists 11 Florida localities where the birds have been found including "Sarasota: Ocala National Forest"!

Harrington, B. A. 1983. The migration of the Red Knot. Oceanus 26: 44-48. —Florida is on their itinerary.

HENNEMANN, W. W., III. 1983. Environmental influences on the energetics and behavior of Anhingas and Double-crested Cormorants. Physiol. Zool. 56: 201-216.—The cormorants were from Suncoast Seabird Sanctuary, Pinellas Co.; presumably the Anhingas were also from Florida.

HENNY, C. J. 1983. Distribution and abundance of nesting Ospreys in the United States, Pp. 175-186 *in* Bird, D. M., (Ed.). Biology and management of Bald Eagles and Ospreys.—Includes Florida where the estimated 1981 population of 1,500-2,000 pairs minimum (based on pers. comm., Steve Nesbitt) is rivaled only by Chesapeake Bay area.

JACKSON, J. A. 1983. Nesting phenology, nest site selection and reproductive success of Black and Turkey vultures. Pp. 245-270 *in* Wilbur, S. R., and J. A. Jackson, eds. Vulture biology and management. Univ. Calif. Press. —Nest records obtained from egg collections and literature references were analyzed by degrees latitude, and presumably include Florida data.

JAMES, F. C. 1983. Environmental components of morphological differentiation in birds. Science 221: 184-186.—Experimental transplants of Red-winged Blackbirds eggs between nests in northern and southern Florida and from Colorado to Minnesota, show that in this species a significant proportion of the regional differences in nestling development is non-genetic.

KALE, H. W., II. 1983. A status report on the Dusky Seaside Sparrow. Bird Conservation 1: 128-132.—A brief history of efforts to save the few remaining birds thru mid-1982.

KELLER, T. C. 1983. First Indiana record of the California Gull (*Larus californicus*). Amer. Birds 37: 120.—Includes a summary of recent eastern records; three from Florida.

KIFF, L. F., ET AL. 1983. Eggshell thickness and DDE residue levels in vulture eggs. Pp. 440-458 *in* Wilbur, S. R., and J. A. Jackson, eds. Vulture biology and management. Univ. Calif. Press.—Florida data for Black and Turkey vultures and Crested Caracaras.

KILHAM, L. 1983. Life history studies of woodpeckers of eastern North America. Publ. Nuttal Ornithol. Club 20: 1-240.—Portions of Pileated Woodpecker, Red-headed Woodpecker, and Northern Flicker accounts based on observation in Highlands Co.

KLIMKIEWICZ, M. K., R. B. CLAPP, AND A. G. FUTCHER. 1983. Longevity records of North American birds; Remizidae through Parulinae. J. Field. Ornithol. 54: 287-294.—Florida records include Red-whiskered Bulbul, 4 years; Western Palm Warbler, 6 yr., 7 months; Yellow Palm Warbler, 5 yrs, 10 months.

KUSHLAN, J. A. 1983. Special species and ecosystem preserves: colonial waterbirds in U.S. National Parks. Environmental Mgmt. 7: 201-207.—Ideas based in part on author's studies in Florida.

KUSHLAN, J. A., AND O. L. BASS, JR. 1983. Decreases in the southern Florida Osprey population, a possible result of food stress. Pp. 187-200 *in* Bird, D. M., (Ed.). Biology and management of Bald Eagles and Ospreys. —Authors compare their aerial census data (1978-1980) with that of Ogden (1968-1974).

LANGE, R., JR., W. R. DAVIDSON, AND D. J. FORRESTER. 1983. Common Loon mortality. J. Wildl. Dis. (Newsletter) 19(3): Supplement not paginated. —Brief report of duration and extent of loon die-off in January-March 1983, Florida Gulf coast.

Layne, J. N. 1983. Productivity of Sandhill Cranes in south central Florida. J. Wildl. Mgmt. 47: 178-185.

Leberman, R. C., and D. S. Wood. 1983. Bird-banding at Powdermill: twenty years reviewed. Powdermill Nature Reserve Res. Rept. 42: 1-49.—1961-81. Four species banded at Powdermill NR in western Pennsylvania were recovered in Florida; American Robin-2, Yellow-rumper Warbler-2, Indigo Bunting-1, Brown-headed Cowbird-1.

Loftin, R. W., and D. Roberson. 1983. Infanticide by a Purple Martin. Wilson Bull. 95: 146-148.—Jacksonville, Duval Co.

Marion, W. R., et al. 1983. Prevalence of *Clostridium botulinum* type C in substrates of phosphate-mine settling ponds and implications for epizootic of avian botulism. J. Wildl. Dis. 19: 302-307.—The bacteria were present in 5% of sediment samples from 4 of 7 ponds in Hamilton Co.

McDonald, M. V. 1983. Breeding bird census. No. 176. Gulf coast salt marsh. Amer. Birds 37: 100.—Cedar Key-6 km NNW, Levy Co.

Montalbano, F., III, J. E. Thul, and W. E. Bolch. 1983. Radium-226 and trace elements in Mottled Ducks. J. Wildl. Mgmt. 47: 327-333.—Birds were collected in Polk Co., and at Lake Okeechobee.

Nesmith, S. 1983. Winter bird-population study. No. 14. Mature beech-magnolia forest. Amer. Birds 37: 34.—At Tall Timbers Res. Sta., Leon Co.

Ogden, J. C., and B. W. Patty. 1982. The recent status of the Wood Stork in Florida and Georgia. Pp. 97-103 *in* Odom, R. R., and J. W. Guthrie (Eds.). Proc. nongame and endangered wildlife symposium. Georgia Dept. Nat. Resc., Game & Fish Div., Tech Bull. WL 5.

Orr, O. H. 1983. T. Gilbert Pearson: young ornithologist in Florida. Fla. Historical Quart. 62: 159-179.—In and around Alachua Co., 1885-1896. This teen-age oologist, taxidermist, hunter, and naturalist became the first secretary of the National Association of Audubon Societies in 1905.

Powell, G. V. N. 1983. Food availability and reproduction by Great White Herons, *Ardea herodias*: a food addition study. Colonial Waterbirds 6: 139-147.—As studied in eastern Florida Bay.

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Funderberg, J. B., Jr., and T. L. Quay. Distributional evolution of the Seaside Sparrow. Pp. 19-27.

HARDY, J. W. Geographical variation in primary song of the Seaside Sparrow. Pp. 95-98.—Dusky and Cape Sable Seasides have the simplest songs.

KALE, H. W., II. Distribution, habitat, and status of breeding Seaside Sparrows in Florida. Pp. 41-48.—Of the six subspecies of *Ammospiza maritima* (formerly) resident in Florida's coastal marshes, *nigrescens* is extinct in the wild and *pelonota* is gone from St. Johns and Volusia co. The other populations seem reasonably safe.

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ROBBINS, C. S. Distribution and migration of Seaside Sparrows. Pp. 31-40. —History of our knowledge of Seaside distribution presented in five maps, 1895-1981. All subspecies except northern race are presumed to be primarily sedentary.

TAYLOR, D. L. Fire management and the Cape Sable Sparrow. Pp. 147-152.

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SERIE, J. R., D. L. TRANGE, AND D. E. SHARP. 1983. Migration and winter distribution of Canvasbacks staging on the upper Mississippi River. J. Wildl. Mgmt. 47: 741-753.—Of 1,488 birds color-marked or banded in Wisconsin/ Minnesota, 10 were recovered from throughout Florida.

Shapiro, A. E. 1983. Characteristics of Red-cockaded Woodpecker cavity trees and colony areas in southern Florida. Fla. Sci. 46: 89-95.—At 5 wildlife management areas from Three Lakes WMA south to Big Cypress WMA.

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Wood, D. A., Ed. 1983. Red-cockaded Woodpecker Symposium II Proceedings. Tallahassee, Florida Game & Fresh Water Fish Comm. 112 pp.—Of 32 papers and notes included in this volume, the 16 concerning Florida are listed below.

Baker, W. W. Decline and extirpation of a population of Red-cockaded Woodpeckers in northwestern Florida. Pp. 44-45.—At Tall Timbers Res. Sta., Leon Co., Red-cockadeds declined from 40 adults in 1970 to none in 1981.

Baker, W. W. A non-clamp patagial tag for use on Red-cockaded Woodpeckers. Pp. 110-111.—As perfected at Tall Timbers.

Barnett, B. S., D. T. Gilbert, and H. W. Kale, II. A Red-bellied Woodpecker found dead in resin at a Red-cockaded Woodpecker cavity. P. 110.—Charlotte Co.

Bartush, W. S., and D. A. Wood. Red-cockaded Woodpecker management in northwestern Florida. Pp. 83-86.—Sixteen Panhandle counties.

Delotelle, R. S., and J. R. Newman. Possible factors influencing Red-cockaded Woodpecker colony abandonment: a case study. Pp. 104-106.—At the proposed Stanton Energy Ctr., 21 km SE of Orlando, Orange Co.

Delotelle, R. S., J. R. Newman, and A. E. Jerauld. Habitat use by Red-cockaded Woodpeckers in central Florida. P. 59-67.

Jansen, D. K. A possible instance of two Red-cockaded E Woodpeckers roosting in the same hole. Pp. 100-101.—Big Cypress Natl. Pres., Collier Co.

Jansen, D. K., and G. A. Patterson. Late nesting and low nesting success of Red-cockaded Woodpeckers in the Big Cypress National Preserve, Florida, in 1983. P. 99.

Jerauld, A. E., R. S. Delotelle, and J. R. Newman. Restricted Red-cockaded Woodpecker clan movements during reproduction. Pp. 97-98.—At the proposed Stanton Energy Ctr.

Lennartz, M. R., et al. Status of the Red-cockaded Woodpecker on federal lands in the South. Pp. 7-12.—Includes some Florida sites with ca. 510 colonies on Apalachicola Natl. Forest.

Lennartz, M. R., et al. Status of Red-cockaded Woodpecker nesting habitat in the South. Pp. 13-19.—Includes Florida.

Locke, B. A., and R. N. Conner. A statistical analysis of the orientation of entrances to Red-cockaded Woodpecker cavities. Pp. 108-109.—Utilizes Florida data.

Nesbitt, S. A., A. E. Gerauld, and B. A. Harris. Red-cockaded Woodpeckers summer range sizes in southwestern Florida. Pp. 68-71.—At the C. M. Webb WMA, Charlotte Co.

Nesbitt, S. A., et al. The Responses of a male Red-cockaded Woodpecker to drastic habitat alteration. Pp. 101-104.—Near and at C. M. Webb WMA.

Patterson, B. G. A., and W. B. Robertson, Jr. An instance of Red-cockaded Woodpecker nesting in a dead pine. Pp. 99-100.—In Big Cypress NP.

Wood, D. A., and A. Shapiro Wenner. Status of the Red-cockaded Woodpecker in Florida: 1983 update. P. 89.

Young, P. 1983. Groove-billed Ani at Savannah River National Wildlife Refuge, SC. Chat 47: 23-25.—Includes an editor's note discussing Groove-billed records east of the Mississippi featuring Florida records.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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FLORIDA ORNITHOLOGICAL SOCIETY SPECIAL PUBLICATIONS

Species index to Florida bird records in Audubon Field Notes and American Birds volumes 1-30 1947-1976, by Margaret C. Bowman. xii + 42 pp. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00. Order prepaid from the Vice-President.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 13, NO. 1 FEBRUARY 1985 PAGES 1-24

DISTRIBUTION OF BLACK BEARS IN FLORIDA

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The black bear (*Ursus americanus floridanus*) is Florida's largest land mammal, yet despite its size it is rarely observed in the wild. Because of concern over habitat destruction and illegal killing, the black bear was listed as threatened by the Florida Game and Fresh Water Fish Commission (Williams 1978). Their requirements for large areas of habitat makes Florida black bear populations vulnerable, and the species requires special attention. However, censusing black bears, even on a local scale, is complicated by the expanse of their territories, the impenetrable nature of their habitat, and their tendency to avoid humans. A reliable estimate of the statewide bear population is even less attainable. Yet, distribution data can be acquired by other means to provide a useful insight to the status of the statewide population with which historic and future conditions can be compared.

Williams (1978) published a black bear distribution map based on a 1975 mail survey of Florida Game and Fresh Water Fish Commission field personnel. Recently, the frequency of road-kills and reports of black bear depredation in central and south Florida suggest that the range of the bear may be expanding in these areas. However, these observations are confounded by an increase in the chances of bear-human encounters. Therefore, another county-by-county survey was conducted to help clarify the status of black bears in Florida and to develop an updated map of their statewide distribution.

Florida Field Naturalist 13: 1-7, 1985.

Methods

We interviewed Florida Game and Fresh Water Fish Commission personnel from all areas of the state. They were asked to indicate on county road maps the specific areas where they knew bears occurred. Additionally, we reviewed records of bear reports in Everglades National Park. On-site inspections and aerial surveys were conducted to determine if habitat conditions were consistent with reported black bear occurrences. A preliminary composite map was prepared and mailed to cooperators for comments, which were incorporated into the final map. The locations of road-killed bears recorded from 1978 through September 1983 also were plotted. Specific occurrences of black bears dating from the late 18th century were obtained from a literature review. We use these as an indication of historic distribution.

Results and Discussion

Black bears were apparently widespread throughout Florida except for some islands until the late 19th century. Bears were observed primarily in large isolated tracts (Maynard 1883, Chapman 1894, Hamilton 1941, Davis 1943). Hall (1981:950) identified peninsular Florida to Alabama as the range of the Florida subspecies of the black bear. Old published records of black bears in Florida include the following: Anastasia Island, St. John's County and Indian River County (Bangs 1898) ; Matecumbe Key, Monroe County (DePourtales 1877) ; Brevard County (Cory 1896:55) ; Key Biscayne, Dade County (Merriam 1896) ; Royal Palm State Park, Dade County (Safford 1919) ; Lee County (Hamilton 1941) ; St. Augustine, St. John's County, Drayton's Island, Putnam County and Alachua County (Bartram 1943) ; Volusia County (Harlow 1956) ; Okeefenokee Swamp, Baker County (Harper 1927) ; Palm Valley, St. John's County (Ivey 1959) ; Welaka, Putnam County (Moore 1946, 1949) ; Highlands County (Rand and Host 1942) ; and Ormond Beach, Volusia County and Panama City, Bay County (Smith 1971).

Black bear population size has been estimated for several areas in Florida. Rand and Host (1942) reported a population of about 12 in Highlands County. Schemintz (1972, Unpubl. Rept., Game Mgt. Division, Fla. Game and Fresh Water Fish Commission, Tallahassee, Florida; 1974) estimated 100 bears in Collier County, 10 in Hendry County, 20 in Monroe County and 5 in Palm Beach County. Eighty-100 bears were reported to occur in the Big Cypress Swamp, Collier County (U.S. Dept. Int. 1969, Unpubl. Rept. Environmental Impact of The Big Cypress Jetport). Schwartz (1952) observed in extreme south Florida that bears were "most common" in the head-

waters of the Shark River in Monroe County. The species was described as rare in south Florida in 1943 (Davis 1943) and "desparately low" in the Everglades during 1948 (Cahalane 1948). A density of 1 bear per 3.5 km^2 was estimated in the Osceola National Forest, Columbia and Baker Counties (U.S. Dept. Int. 1979, Unpubl. Rept. Final supplement to the final environmental statement: phosphate leasing on the Osceola National Forest, Florida, Bureau of Land Management, Alexandria, Virginia).

Statewide, the population has been estimated to be fewer than 500 (Frye et al. 1950, East 1977:60), 500 (Pelton and Nichols 1972), 500-600 (Smith 1971), 800-1000 (Harlow 1962, obtained by multiplying the total legal and illegal kill by 10), and 1000 (Smith 1971, U.S. Dept. Int. 1969). Centers of black bear abundance have been identified as the entire mainland (Maynard 1883), east coast scrublands (Howell 1929), Osceola and Apalachicola National Forests, St. John's River Swamps, Gulf Coast from Leon County to Hernando County, sections of the Everglades (Frye et al. 1950, McDaniel 1974, Williams 1979), Central and Northeast Florida (Harlow 1961), Collier County (Layne 1974), Durbin Swamp, Duval County and Fakahatchee Strand, Collier County (McDaniel 1974), and remote coastal plains swamps (McDaniel 1974, Nat. Fish and Wildl. Lab 1978, Unpubl. rept., Osceola National Forest phosphate extraction and processing, U.S. Fish and Wildlife Service, Gainesville, Florida). Pelton and Nichols (1972) estimated that the Florida black bear population was evenly divided (1/3 each) among the panhandle, northeast region, and the remaining peninsula. Decreases in bear numbers and range due to habitat destruction and human encroachment were initially reported by Harper (1927) and Howell (1929).

Figure 1 illustrates the current black bear range in Florida as indicated by the present survey. The distribution of road-kills coincides closely with the survey results. Although discontinuous, the range extends from extreme northwest Florida to the southern tip of the peninsula with some evidence of occurrence in 50 counties (75%). The most extensive portions of the range occur on large tracts of public lands, principally Apalachicola, Osceola, and Ocala National forests, The Big Cypress Preserve, and Okeefenokee National Wildlife Refuge, in Georgia. Smaller concentrations overlap other public lands including Everglades National Park, Chossahowitzka National Wildlife Refuge, and Eglin Air Force Base. The remaining portions are found on relatively undisturbed private ranch and timber company lands. This range encompasses a wide

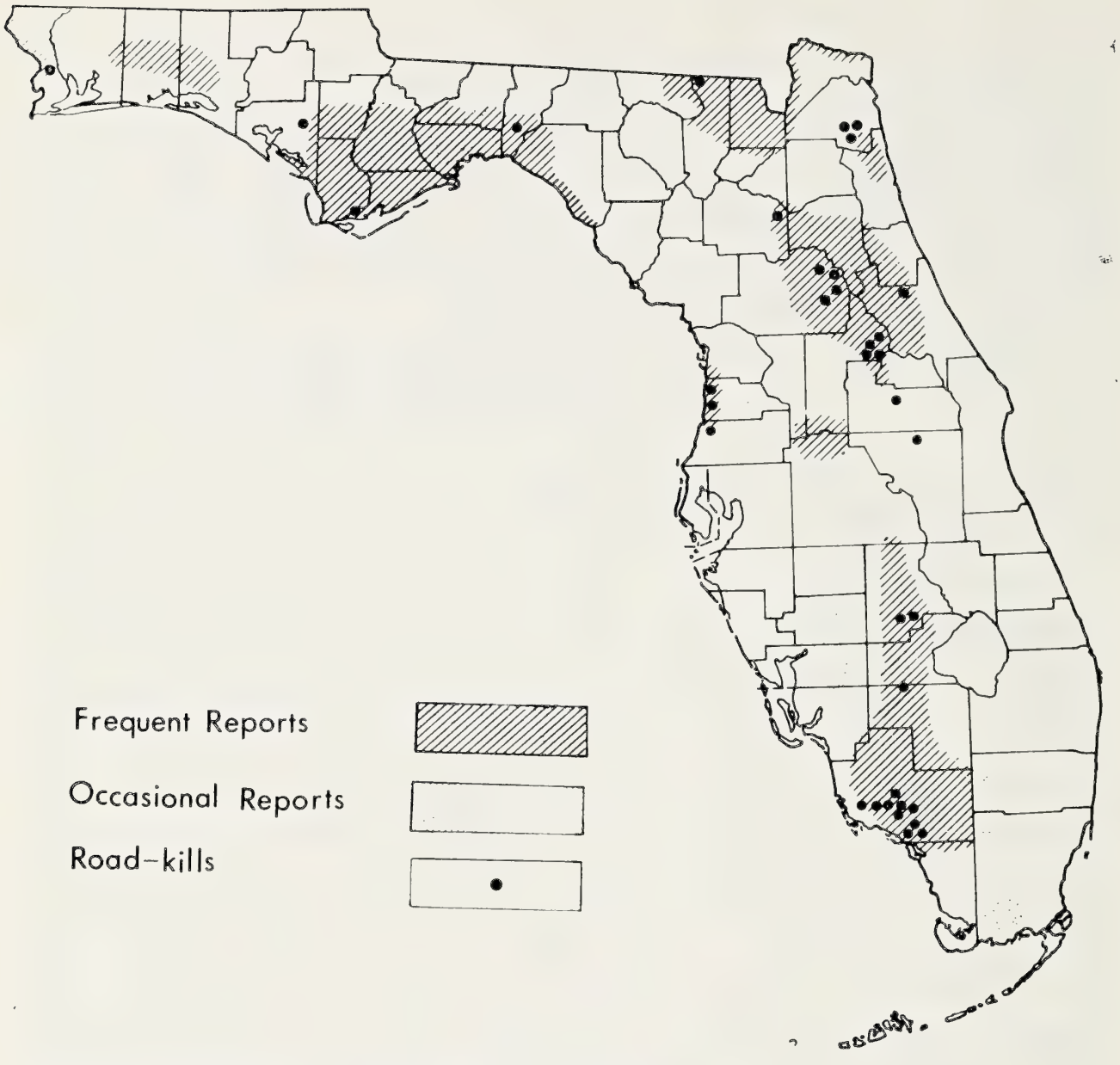

Fig. 1. Distribution of Black Bears in Florida.

variety of habitats, however the black bear is consistently found within large tracts of woodland types.

This present disjunct distribution and the absence of bears from large areas of the state contrasts with the more generalized historic distribution. Noteworthy is the absence of bears from the eastern coastal areas and large portions of central and north-central Florida. These areas are characterized by extensive urbanization and agriculture-related habitat changes. An exception is the coastal area of Dixie, Levy and northern Citrus counties. No bears were reported here, although seemingly adequate habitat remains.

A comparison of Figure 1 with Williams' (1979) map shows close agreement, especially with regard to the major areas of bear occurrence. We attribute minor differences to the inherent imprecision of the methodology. The most significant difference between Figure 1 and Williams' (1978) map is in the Dixie, Levy and Citrus counties area. Williams (1978) showed bears to occur continuously along the coastal portions of these counties while none were reported from that area in the present survey.

That this discrepancy reflects an extirpation of bears from these counties between 1978 and 1983 seems unlikely. The hunting of bears in this area has been prohibited since 1971 and vast areas of suitable woodland habitats remain. Although it seems clear that bears no longer occur in this area, we believe that the extirpation occurred before 1978 and probably resulted from widespread persecution by cattlemen and beekeepers. It seems more probable that the earlier reports noted reflect lesser efforts than in the present study to confirm survey responses via personal interviews and on-site visits.

The remaining fragments of bear distribution are analogous to the habitat islands described by Simberloff (1974) where occupied range is "isolated from similar habitats by different, relatively inhospitable terrain". Such island populations risk genetic consequences (Grieg 1979 and Franklin 1980) and if immigration ceases altogether, extinction may be inevitable (Diamond 1978). Therefore, although black bear habitat types are currently widespread in Florida, the threat posed by habitat fragmentation should not be overlooked. It is clear that isolation of once contiguous populations has resulted in restricted immigration potential, and as population isolates become reduced in size the chances of local extinction are enhanced.

Summary

Historically, black bears occurred throughout the Florida mainland and on some coastal islands, often associated with large forested tracts. Currently, the black bear remains widespread in Florida, but its distribution is reduced and has become fragmented. Large undeveloped woodland tracts are still the preferred habitat. The continued fragmentation of remaining bear habitat and the local extinctions which will likely follow are an important threat to black bear existence in Florida.

Acknowledgments

We wish to thank the field personnel of the Florida Game & Fresh Water Fish Commission who provided information about bear occurrence in their respective areas. We also thank J. A. Kushlan for providing records of bear locations in the Everglades National Park. This is a contribution to Federal Aid to Wildlife Restoration. Project W-41-R.

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NOTES

Foods of black bears in Florida.—Food habits descriptions are essential to understanding the role of an animal in its environment and in making management decisions to improve habitat quality or to predict the consequences of habitat alteration due to human disturbance. Black bears (*Ursus americanus floridanus*) are widely distributed in Florida (Brady and Maehr 1985), and utilize a wide range of habitats. Maehr and Brady (1982a, 1984) discussed the fall food habits of Florida bears in northeast Florida, and seasonal and geographic trends in the diet. Their conclusions were based on species accounting for 3% or more of the diet in any one season. Hence, many species eaten by black bears have not previously been reported. Further, 57 additional samples have been analyzed since Maehr and Brady's (1984) report. In this paper, therefore, we present a list of foods eaten by black bears in Florida.

Stomachs and scats were collected throughout the state from summer through winter 1978-1984. Details of data analysis can be found in Maehr and Brady (1984). In this paper we deleted the detailed volume measurements in order to combine stomach and scat data, as well as to simplify tabulation. We observed that the frequency of occurrence for each food item reflected its importance relative to volume eaten. Because of this, we also included data from the analysis of 13 stomachs collected in Ocala National Forest (Harlow 1961). Scientific names of species mentioned in the text appear in Table 1.

A list of Florida black bear foods is useful for a number of reasons. The use of distinctly different foods from a variety of plant and animal taxa emphasises the extremely opportunistic and omnivorous habits of black bears. Further, although the most frequently eaten foods (saw palmetto, swamp tupelo, bessie bugs, etc.) can be considered extremely important, less common or unpreferred foods may serve as replacements during years of mast failures or otherwise low food availability. It may be the presence of these less commonly eaten foods that distinguishes occupied bear habitat from other apparently suitable forest land.

This list should not be viewed as complete. However, due to the sample size ($n = 244$) we feel that all consistantly utilized foods are represented. It is likely that with continued examination of scats and stomachs, additional items would be included in the known diet of Florida bears. One food item does not appear on our list yet was apparently a staple in bear diets until the development of Florida's east coast. De Pourtales (1877) and Chapman (1894), both early Florida naturalists, reported that bears commonly fed on the eggs of sea turtles. Because of the virtual elimination of native east coast vegetation and isolation from mainland bear populations (i.e., road building and other development), bears can no longer rely on this traditional high protein and energy food source.

The majority of food items listed (93%) are native plants and animals. However, several introduced species appear to be important foods. Brazilian pepper is a common winter food in south Florida, providing bears with abundant fruits during a period usually characterized by a food shortage (see also Maehr 1984). The honey bee, introduced to Florida by early European settlers, is the most commonly eaten insect. Because honey bees are normally

TABLE 1. Foods eaten by Florida black bears based on 116 stomachs and 128 scats.

Food item	Type[1]	Frequency
PLANTS		394
Monocots		166
Saw palmetto (*Serenoa repens*)	s,l	82
Sabal palm (*Sabal palmetto*)	s,l	25
Alligator flag (*Thalia geniculata*)	l	7
Needle palm (*Rhapidophyllum virginica*)	l,s,st	2
Unidentified grass (Gramineae)	l	6
Bald cypress (*Taxodium distichum*)	l,st	4
Greenbriar (*Smilax* spp.)	s	3
Corn (*Zea mays*)	s	2
Green arum (*Peltandra virginica*)	l,s,st	2
Spoon flower (*Peltandra sagittifolia*)	s,l	1
Scrub palmetto (*Sabal etonia*)	s	1
Unidentified monocot	l,st,s	27
Dicots		200
Swamp tupelo (*Nyssa biflora*)	f,s	46
Oaks (*Quercus* spp.)	l,s	44
Blueberry (*Vaccinium* spp.)	f,s	29
Unidentified dicot	l,st,s	18
Gallberry (*Ilex glabra*)	f,s	13
Odorless bayberry (*Myrica inodora*)	f,s	8
Brazilian pepper (*Schinus terebinthifolius*)	s	7
Fetterbush (*Lyonia lucida*)	l,s	4
Red bay (*Persea palustris*)	f,s	4
Grape (*Vitis* spp.)	f,s	3
Raspberry (*Rubus* spp.)	f,s	3
Hickory (*Carya* spp.)	s	2
Pennywort (*Hydrocotyle* spp.)	l,st	1
Pokeweed (*Phytolacca rigida*)	l	1
Pond apple (*Annona glabra*)	f,s	1
Sugarberry (*Celtis laevigata*)	s	1
Sunflower (*Helianthus* spp.)	l,st	1
Sweetleaf (*Symplocos tinctoria*)	l	1
Wild coffee (*Psychotria lagustrifolia*)	s	1
Crab apple (*Malus angustifolia*)	f,s	1
Cultivated bean (*Phaseolus* spp.)	s	1
Dwarf huckleberry (*Gaylussacia mosieri*)	f,s	1
Swamp dogwood (*Cornus foemina*)	s	1
Fringe tree (*Chionanthus virginicus*)	s	1
Hawthorne (*Crataegus* spp.)	s	1
Scrub rosemary (*Ceratiola ericoides*)	s	1
American holly (*Ilex opaca*)	s	1
American beautyberry (*Callicarpa americana*)	s	1

TABLE 1. (Continued)

Food item	Type[1]	Frequency
Other plants		25
Spanish moss (*Tillandsia usneoides*)	l	5
Fern	l	1
Lichen	l	1
Unidentified plant tissue	l,st,s	18
INSECTS		184
Bees and Wasps		74
Honey bee (*Apis mellifera*)		32
Yellow jacket (*Vespula squamosa*)		18
Paper wasp (*Polistes* spp.)		9
Yellow jacket (*Vespula maculifrons*)		6
Small social wasp (*Mischocyttanus cubensis*)		5
Parasitic wasp (*Apocrita*)		4
Bumble bee (*Bombus* spp.)		4
Bumble bee (*Bombus bimaculatus*)		3
Carpenter bee (*Xylocopa* spp.)		2
Bumble bee (*Bombus pennsylvanicus*)		1
Ants (Formicidae)		41
Florida carpenter ant (*Campanotus abdominalis floridanus*)		22
(*Campanotus* spp.)		7
(*Crematogaster* spp.)		2
Fire ant (Myrmicinae)		1
(*Neivamyrmex* spp.)		1
(*Tapinoma sessile*)		1
Unidentified ants		7
Beetles (Coleoptera)		39
Bessie bug (*Odontotaenius disjunctus*)		29
Ground bettle (*Carabidae*)		2
Acorn weevil (*Curculio* spp.)		3
Scarab beetle (*Strategus antaeus*)		1
Carrion beetle (*Silpha inaequalis*)		1
Click beetle (Elateridae)		1
(*Phengodes* spp.)		1
Unidentified beetle		1
(Orthoptera)		10
Walking stick (*Anisomorpha buprestoides*)		9
Short-horned grasshopper (Acrididae)		1

TABLE 1. (Continued)

Food item	Type[1]	Frequency
Flies (Diptera)		5
Blow fly (Calliphoridae)		3
Flesh fly (Sarcophagidae)		1
(*Phaenicia* spp.)		1
Other Insects		15
Giant water bug (Belostomatidae)		1
Cicada (Cicadidae)		1
Aquatic burrowing bug (Naucoridae)		1
Backswimmer (Notonectidae)		1
Leafhopper (*Coelidia* spp.)		1
Unidentified insects		10
OTHER ARTHROPODS		3
Crayfish (Astacidae)		1
Centepede (Chilopoda)		1
Tick (Acarina)		1
VERTEBRATES		40
Armadillo (*Dasypus novemcinctus*)		9
Bird (unidentified egg & feathers)		7
Deer (*Odocoileus virginianus*)		4
Feral hog (*Sus scrofa*)		3
Alligator (*Alligator mississippiensis*) (eggs)		1
Gopher tortoise (*Gopherus polyphemus*)		1
Water snake (*Nerodia* spp.)		1
Unidentified mammal		7
Unidentified bone		1
Unidentified animal tissue		6

[1]f—fruit, s—seed, l—leaves, st—stem.

obtained at commercial apiaries (beeyards), a serious conflict between black bears and beekeepers has developed (Maehr and Brady 1982b). Armadillos are the most common vertebrate in Florida black bear diets. In as much as armadillos are "destroying the organization and productivity of the leaf-mold stratum of the forest" (Carr 1983), black bears might be important in regulating armadillo numbers in occupied bear range. Exotics account for 7% of the food items used by bears, and for 9% of the total frequency.

We thank D. W. Hall for assistance with plant identifications. J. C. Nickerson, L. A. Stange, H. V. Weems, Jr., and R. E. Woodruff assisted with insect identifications. J. R. Brady, L. Cutts, J. Mykytka, J. A. Rodgers, S. Schwikert, and A. G. Spratt assisted with specimen collections. This is a contribution from Fla. Fed. Aid to Wildl. Restoration Proj. W-41-R.

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Florida Field Naturalist 13: 8-12, 1985.

Red-tailed Hawk drowns Yellow-crowned Night Heron.—While walking along a dirt road near the San Pablo River in Duval County, Florida at approximately 1645 on 12 July, 1983, I flushed a juvenile Yellow-crowned Night Heron (*Nycticorax violaceus*) from a pool of rainwater. The bird flew around a bend where trees blocked my view. A few seconds later I heard a slapping sound, like a very loud punch, and the squawking of a heron.

When I rounded the bend I saw that an adult Red-tailed Hawk (*Buteo jamaicensis*) had pinned down a juvenile Yellow-crowned Night Heron in a small puddle (1m by 30cm by approximately 10cm deep) which had formed in a tire rut. I suspect that the slapping sound was the hawk hitting the same heron I had previously flushed.

I approached to within 5m of the two birds and remained there for twenty to thirty minutes photographing and watching the birds. The hawk had one foot on the heron's head and the other on its body. The heron occasionally flapped a wing or struggled to which the hawk responded by shifting in a way that appeared to hold the heron's head more firmly under water, and he often looked at the heron as if to see if it was dead yet (Fig. 1). He periodically looked up into a nearby stand of pines where another Red-tailed Hawk was calling. After nearly thirty minutes the heron appeared to be dead, but the hawk remained with it. Leaving the scene, I passed within two meters of the birds, but the hawk made no motion indicative of flying off.

Fig. 1. Red-tailed Hawk holding Yellow-crowned Night Heron under water.

The event, from the time I flushed the heron to the time I left lasted approximately thirty-five minutes. Based on the hawk's responses to the heron's struggles, and his periodic checking of the heron's condition, and on study of my photographs that show that the hawk did not initially have the heron immersed in the water (a fact which I did not notice at the time), I believe that he was intentionally making use of the water to drown the heron. The hawk remained in the water for nearly half an hour keeping the heron's head submerged even though the water was shallow enough for the heron to have otherwise lifted his head out. The method used by this hawk to drown the heron was similar to that reported for the Cooper's Hawk (*Accipiter cooperii*) (Gerig 1979) and the Northern Harrier (*Circus cyaneus*) (Fitzpatrick 1979) in two other cases (both in Amer. Birds 33; 836-837).

Thanks to Dr. Robert W. Loftin for editorial comments on an early draft of this note.—**Bob Richter**, 6656 Diane Rd. Jacksonville, Florida 32211.

Vagrancy and associated mortality of Black Scoters in peninsular Florida.— The Black Scoter (*Melanitta nigra*) is a vagrant south along peninsular Florida (Howell 1932, Bellrose 1976). An unusual influx of Black Scoters occurred during the winter of 1981-82, with numerous birds recorded as far south as Fort Lauderdale on the Atlantic Coast and Naples on the Gulf Coast. The bird collection of the University of South Florida (USF) received 15 Black Scoters, mostly immature birds, during the winter and spring of 1981-82. Here we document the recent occurrence of Black Scoters in Florida and the associated mortality during the 1981-82 influx.

All specimens examined were birds found sick on Florida beaches from November 1981 through May 1982. Fourteen specimens, all from Pinellas County beaches, were obtained from the Suncoast Seabird Sanctuary, a rehabilitation facility in Pinellas County. One specimen from Indian River County on the Atlantic Coast was delivered to USF by Herbert W. Kale, II. In addition, we obtained information, but unfortunately no specimens, on the occurrence of sick scoters at CROW (Care and Rehabilitation of Wildlife), a rehabilitation facility on Sanibel Island in Lee County.

Occurrence. Table 1 presents the number of Black Scoters found on coastal Christmas Bird Counts (CBC) from the winters of 1970-71 through 1982-83 (American Birds 1971-1983, Vol. 25-37). Only counts in which Black Scoters were found at least once are listed. In a given year, if no Black Scoters were recorded, but unidentified scoters were recorded, we list this number parenthetically. We suspect most of the unidentified scoters recorded on these CBCs are Black Scoters because based upon our analyses this species is recorded far more often and in greater numbers in peninsular Florida than are the other scoter species. Although total coverage of count areas in Florida may vary, accessible areas of coastline normally are covered intensively.

Black Scoters appear to winter regularly in small numbers on the upper Atlantic Coast of Florida (Table 1). Between the Jacksonville, St. Augustine, and three Brevard County CBCs, Black Scoters were recorded in 11 of the 13 winters. Unidentified scoters were recorded the other two years. During the same period Black Scoters appeared much less often on the Gulf Coast of Florida. There, Black Scoters were recorded in only 46% of the winters. A single unidentified scoter in Bay County may be a record for a seventh winter. Black Scoters may winter more often along the panhandle Gulf Coast of Florida than along the peninsula. At Panacea, for example, Black Scoters were recorded on many of the CBCs from 1960-61 through 1971-72, the last winter of counting.

Table 1 shows clearly that an incursion of Black Scoters occurred along the Gulf Coast of peninsular Florida in 1981-82. During that winter 50% of the eight counts we summarize recorded scoters. The high for the previous 11 years was two counts recording scoters. Another large influx occurred the next winter 1982-83, when 38 individuals were counted as compared to 60 individuals in 1981-82. The recording in winter 1981-82 of Black Scoters on all five CBCs on the northern Atlantic Coast of Florida and the large total numbers summarized shows that the incursion to the Gulf Coast was part of a larger movement.

TABLE 1. The occurrence of Black Scoters on selected Christmas Bird Counts in Florida.

Count location	Year												
	70-1	71-2	72-3	73-4	74-5	75-6	76-7	77-8	78-9	79-80	80-1	81-2	82-3
Jacksonville	(14)[1]	1	0	0	19	2	0	0	54	1	(4)	250	48
St. Augustine	—[2]	—	—	—	0	0	(1)	1	*	(3)	0	214	54
Merritt Island	0	0	3	(1)	15	41	5	33	11	(1)	0	57	35
Cocoa	(2)	0	0	4	0	1	3	(3)	3	0	0	19	19
South Brevard	0	140+	(25)	1	0	0	5	(6)	0	0	0	1	0
subtotal	(16)	141	28	6	34	44	14	43	68	5	(4)	541	156
Ft. Pierce	0	0	0	0	0	0	0	(7)	0	0	0	0	0
Stuart	(10)	0	0	0	0	0	0	0	0	0	0	0	70
West Palm Beach	0	0	0	0	0	0	0	3	0	0	0	35	45
Ft. Lauderdale	0	0	0	0	0	0	0	0	0	0	0	*[3]	(125)
Dade County	0	0	0	0	0	0	0	1	—	0	0	0	0
subtotal	10	0	0	0	0	0	0	11	0	0	0	35	240
Pensacola	0	0	0	0	0	0	0	1	0	0	0	0	0
Bay County	0	0	0	1	0	0	(1)	0	0	0	0	1	0
North Pinellas	—	—	—	—	—	—	0	0	0	0	0	9	26
St. Petersburg	0	0	0	0	0	9	0	0	2	0	0	50	0
Venice-Englewood	—	—	—	0	0	0	0	0	0	0	0	0	3
Sanibel-Captiva Isl.	0	0	0	0	0	0	0	4	0	0	0	0	8
Naples	0	0	0	0	0	0	0	0	0	0	0	*	0
Coot Bay	0	0	0	0	0	0	0	0	0	0	0	0	1
subtotal	0	0	0	1	0	9	(1)	5	2	0	0	60	38

[1]Numbers in parentheses are the number of unidentified scoters seen.
[2]Indicates no count was performed.
[3]Asterisk indicates that Black Scoters were recorded during count period but not on count day.

The Suncoast Seabird Sanctuary received 16 Black Scoters in the winter and spring of 1981-82, most of which were obtained within the CBC circles of St. Petersburg and North Pinellas. These birds represented 27% of the 59 Black Scoters recorded on these two counts. The two count circles include over half of the potential scoter habitat along the outer beaches of Pinellas County; according to the compilers, coverage of the beach areas was intensive on these two counts. In addition to the 14 specimens we received, two were released after treatment. Bird watching along Pinellas County beaches is intensive regardless of CBCs, and no larger counts of scoters were made, therefore we suspect that fewer than 100 scoters occurred in the county during winter 1981-82.

Black Scoters were not seen on the several Gulf Coast Christmas counts to the south of Pinellas County although an unknown number was present at Naples during the count week (Below 1982). The rehabilitation center (CROW) on Sanibel Island received 1 Black Scoter in December 1981 and 15 during January and February 1982. In addition, they received "many" reports of dead scoters on the beaches of Sanibel and Captiva Islands.

Mortality. Evidence suggests that Black Scoters wintering on the Gulf Coast of Florida in 1981-82 were under physiological stress and in poor condition. At death the females averaged 498 g (range 449-555 g, n=9) and the males 593 g (range 555-619 g, n=4). Scoters remaining in captivity for one or more days prior to death did not differ materially in weight from those that died on the day of capture. These mean weights are only slightly greater than half of presumed normal weight (females, 815 g, n=4 and males 1087 g, n=8, Nelson and Martin 1953; females 999 g, n=2 and males 1135 g, n=7, Bellrose 1976). All 14 juvenile scoters received at USF were in active molt and their molt appeared delayed and possibly protracted relative to that described by Palmer (1976) for the species (Hoffman and Bancroft 1984). In particular. most body molt was delayed until after 1 January, and birds in April still had considerable Juvenal plumage. Their plumage was highly worn suggesting molt was delayed. The additional stress of molt may have contributed to their death.

We suggest that a substantial proportion, and perhaps most, of the Black Scoters involved in the 1981-82 incursion to the Gulf Coast of peninsular Florida died there. The St. Petersburg and North Pinellas CBCs combined, recorded 59 Black Scoters and 2100 Lesser Scaup (*Aythya affinis*), but from November 1981 to May 1982 equal numbers (16) of each species were brought to the Suncoast Seabird Sanctuary (Dianna King, pers. comm.). Because rehabilitation centers received only birds found alive but too weak to escape capture, the ducks Suncoast Seabird Sanctuary received were probably but a fraction of the actual mortality in the area. Differences in habitat use may have resulted in a higher proportion of sick scoters retrieved than scaup, but even so, the conclusion seems sound that mortality of local scoters in the winter 1981-82 was much higher than mortality of a regular and abundant wintering duck, the Lesser Scaup. To the extent that birds' ranges are the product of stabilizing selection for conservative migratory and dispersive behavior, low survivorship and physiological abnormalities (in this case molt) might be expected in vagrants.

We thank Glen E. Woolfenden for critically reading the manuscript and offering numerous suggestions for improvement.

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Florida Field Naturalist 13: 14-17, 1985.

Attacks on fawns, pigs, and other young or weakened mammals by American Crows.—The following observations were made by my wife and I while studying American Crows (*Corvus brachyrhynchos*) at Hendrie's cattle ranch, 24 km south of Lake Placid, Highlands County, Florida, between January 1981 and May 1983 (total observation time 1500 h). The crows and other animals there were relatively tame owing to years of protection and being fed corn. In April 1982, we watched attacks by crows on two spotted deer fawns (*Odocoileus virginianus*) in a pasture over 200 m wide that lay between swamps and contained the nest tree of a group of cooperatively breeding crows (Kilham in prep). On 18 April I observed a fawn 35 cm high and weak on its legs coming toward me. Although accompanied at varying distances by its mother, it was under constant attacks by five crows, two breeding adults and three yearlings. One crow usually clung to the back of the fawn as it ran, while others kept swooping and striking. After running 8-10 m, the fawn collapsed on the grass as if its legs could not hold up any longer. The crows then crowded around, striking the fawn heavily about the head, eyes and other parts. I could not tell whether their bills were closed or slightly open, as I have noted for crows attacking an otter's (*Lutra canadensis*) tail (Kilham 1982, Fla. Field Nat. 10:39-40). The doe seemed to me to be surprisingly unconcerned. She approached repeatedly, head and neck outstretched, to lick her fawn at one end while the crows attacked it at the other. The fawn's only moments of protection were when it nursed under its mother. After fifteen bouts of running, collapsing and being attacked, the fawn reached the edge of a swamp. Walking to within 3 m and using 8 x 40 binoculars, I could perceive no damage done to the fawn's eyes or other parts, in spite of what must have been hundreds of blows. My wife (pers. comm.), 9 days previously, witnessed similar attacks on a slightly larger fawn that, in one of its periodic collapses, struck at its assailants with its forefeet while sitting back on its haunches.

The crows at the ranch were quick to notice any animal that looked young or weak. On one occasion they attacked a young raccoon (*Procyon lotor*) that was rescued by its mother and on another, a suckling feral pig (*Sus scrofa*), both animals being the smallest of their litters. On 11 February 1981, in a more intense attack, a crow rode for 20 m on the back of a suckling pig, the animal running fast with the crow flapping its wings while pounding the pig's head with its bill. A second crow hovered overhead. These attacks were made before the crows had started to nest.

Two other attacks, made on young pigs that were moribund from causes unknown, but still moving, were of interest in revealing behavioral differences between American Crows and Black Vultures (*Coragyps atratus*). On 20 March 1982 I discovered four vultures standing around a dying pig, keeping crows away, but doing nothing, as though waiting for the creature to die. The vultures left when I walked up to within 15 m. Five crows flew in immediately to attack the pig's mouth and anus with their bills, feeding on the pig's still living tissues. On 6 March 1983 I noticed another greatly weakened pig moving about, followed by a train of eight or more vultures, none of them attacking. When the pig came near where I was sitting, the vultures left. A crow then alighted on the pig's flank as it lay down, pecked a hole in front of its ear and, indifferent to the movements of the pig, fed on underlying tissues. A second crow fed on the pig later in the same manner. The pig was still living when I arrived the next morning but died soon afterward.

Crow behavior can be difficult to interpret. One could say that the crows described were defending their nests, but this seems unlikely to us because feral sows with litters commonly passed where crows were nesting without causing any disturbances, and 2 of 7 of the young mammals attacked were attacked before nesting began. When two adult raccoons passed within 15 m of a nest on 12 April 1982, three crows came for a look but only one remained to watch until the animals were gone. An alternate interpretation is that American Crows are not limited to being scavengers of such items as roadside kills, but can, on occasion, be opportunistic predators, attacking young or weakened mammals larger than themselves. This is, apparently, a way of testing whether they can further disable or bring them down. In this they resemble wolves (*Canis lupus*) (Mech, 1970. The wolf. New York, Nat. Hist. Press) that regularly search for deer or other prey that are weak enough to be run down successfully. Since I wrote this note initially, Chadwick (1983, Nat. Geog. 163: 344-385) has published an account, illustrated by photographs, of a Pied Crow (*C. albus*) that, in repeated attacks on the kit of a Bat-eared Fox (*Otocyon megalotis*), several times seized the animal by the tail and attempted to fly off with it. Attacks by American Crows on smaller vertebrates, the young of cotton rats (*Signodon hispidus*), snakes, frogs, and walking catfish (*Clarias batrachus*) have been described elsewhere (Kilham 1984. Fla. Field Nat. 12: 25-31).

I thank Mr. James H. Hendrie, Sr., for letting us visit his ranch and James N. Layne and Fred Lohrer of the Archbold Biological Station, Lake Placid, Florida, for general assistance. **Lawrence Kilham**, Lyme, New Hampshire 03768.

First inland record of the Hudsonian Godwit in northwestern Florida.—The Hudsonian Godwit (*Limosa haemastica*) has been reported in Florida fewer than two dozen times during the past 40 years. Inland records are highly unusual.

On 23 May 1982, I collected a female Hudsonian Godwit (Tall Timbers Research Station No. 3375; prealternate molt; light fat; ovary 8 X 13 mm, largest ovum 2 mm) 1 km east of the junction of highways 20 and 77 in northern Bay County, Florida. This location is about 18 km north of the nearest salt or brackish water. The godwit was feeding in shallow water near broad mud flats of a 10-ha freshwater pond with a flock of 25 Semipalmated Sandpipers (*Calidris pusilla*) and 10 White-rumped Sandpipers (*C. fuscicollis*). This specimen represents the fourth occurrence and first inland record of *L. haemastica* in northwestern Florida.

Previous northwestern Florida records have been of single birds: 15 October 1965 at Panama City, Bay County (James 1966, Aud. Field Notes 20:55-61); 2 May 1981 at Air Products and Chemical Inc. Santuary, Santa Rosa County (Imhof 1981, Amer. Birds 35:832-834); and 4 August 1981 at Pensacola Beach, Escambia County (Purrington 1982, Amer. Birds 36:186-188). The only previous inland record for Florida was a single bird at Zellwood, Orange County on 7 September 1980 (Atherton and Atherton 1980, Amer. Birds 35:172-176).

I thank H. M. Stevenson for providing details of previous records.—**Gary R. Graves**, Department of Biological Science, Florida State University, Tallahassee, Florida 32306. (Present address: Division of Birds, National Museum of Natural History, Smithsonian Institution, Washington D.C. 20560).

Florida Field Naturalist 13: 19, 1985.

Pied-billed Grebe feeding on bread.—During April 1981, at Lake Eola, Orlando, Orange County, Florida, I came across three very tame Pied-billed Grebes (*Podilymbus podiceps*). Persons there rather haphazardly threw small pieces of bread and cookie crumbs to birds, including Rock Doves (*Columbia livia*), American Coots (*Fulica americana*), Ring-billed Gulls (*Larus delewarensis*), and ducks. Although the bulk of the food went to these birds, nevertheless, there were times when a little momentarily lay on the surface of the water not far from one of the grebs. The Pied-billed Grebes, by scurrying with wings extended, managed to capture small pieces, which were immediately swallowed. I estimated the grebes were successful about once in every eight or nine attempts. I noted no aggression shown to the grebes by the other water birds.

I have been unable to find similar published observations of grebes in North America, although the behavior has been reported involving the Little Grebe (*Tachybuptus ruficollis*) in England (Goodwin and Knowles 1961, British Birds 54:402-403; Owen 1973, British Birds 66:227), the Black-throated Little Grebe (*T. novaehollandiae*) in Australia, and the Great Crested Grebe (*Podiceps cristatus*) in England (Owen 1973; England 1974, British Birds 67:302). The lack of records of this behavior in the Pied-billed Grebe emphasizes the unusual and atypical nature of grebes eating non-animal prey.—**Bernard King**, Gull Cry, 9 Park Road, Newlyn, Penzance, Cornwall, TR18 5DZ, England.

Florida Field Naturalist 13: 19, 1985.

A fawn-colored Black Vulture in Glades County, Florida.—Recent notes of color abnormalities in Florida birds prompt us to report an old observation of a fawn-colored Black Vulture (*Coragyps atratus*). The individual was noticed circling in a thermal column with other Black Vultures above the Seminole Indian Reservation west of Lake Okeechobee in Glades County at 1130 h E.S.T. on 9 April 1971. The field notes of J.P.H. state only that the bird was brown, but projection of two color slides taken shows that the bird was a soft tan color except for pure white outer parts of the wings (perhaps only the primary feathers). We could not determine whether the eye and soft-parts were pigmented, but the tan plumage rules out true albinism (total loss of pigment) and full leucism (loss of all feather pigment). Soft tan birds are known as fawn variants, due to phaeomelanin when other pigmentation has been lost (Harrison, 1963, Bird Study 10: 219-233). In this case the normal black coloration of this species is almost certainly due to eumelanin, so the technical designation of this abnormality would be "non-eumelanin phaeomelanin-eumelanin schizochroism" (see Hailman 1984, Fla. Field Nat. 12:36-38). A brief review of "albinism" in North American birds by Gross (1965, Bird-banding 36: 67-71) listed 12 cases between the two species of vultures, but is not broken down by species. Gross used the term "albinism" to include "total or pure" (true albinism), "incomplete" (apparently leucism), "imperfect" (probably a variety of phenomena including schizochroism), and "partial" (leucistic feathers). We can say from the review by Gross, based largely on museum skins, only that some form of pigmentation abnormality has occurred previously in the Black Vulture. Obviously, further observations of a more detailed nature would be desirable to clarify albinism, leucism and schizochroism in this species.—**Jack P. Hailman** and **John T. Emlen**, Department of Zoology, University of Wisconsin, Madison, Wisconsin 53706.

Florida Field Naturalist 13: 20, 1985.

The Yellow Warbler: a diurnal circum-Gulf fall migrant.—The Yellow Warbler (*Dendroica petechia*) is a late summer and early fall migrant, beginning its movement south in July from New England to South Carolina (Bent 1953) and reaching Florida in late July and August (Howell 1932). It is a common fall migrant throughout Florida; August records from Key West and the Tortugas and a record from the eastern Gulf (Buhrman and Hopkins 1978) indicate it makes southward overwater movements. Stevenson (1957) considered it very rare in spring in peninsular Florida and concluded that its principal migration route at that season was along the Texas-Mexican coast and across the western Gulf. From our observations and those of others, we suggest that in late summer and early fall, part of the North American population retraces the spring route and that this movement is both diurnal and coastwise along the northern Gulf Coast. The following observations support this conclusion.

In Florida at Gulf Breeze, Santa Rosa County, in the extreme west Florida panhandle, migration begins in mid-July and peaks between 1 August and 10 September. The following observations were made by Robert Duncan and Lucy Duncan at Gulf Breeze: 4 August 1979, 10 birds moved west between 0730 and 0900, singly and in pairs; 5 August 1979, 13 birds moved west singly and in

twos and threes between 0800 and 0900, 15 to 30 m above the trees; 9 August 1979, two birds came in from the northeast over the bay and alighted in trees at sunset; 12 August 1979, one bird flew west across Pensacola Bay pass at 1530; 21 August 1983, 25 birds moved west in small groups between 0720 and 0810, 30 to 45 m above the treetops. Daytime observations of westerly movements were not limited to these specific instances, as the Duncans have consistently observed such movements for over 10 years at Gulf Breeze. At an inland location, Weber noted the distinctive "zzzp" of Yellow Warblers flying west near Blackwater River State Park, Santa Rosa County, 27 km from the coast, on 19 August 1978.

In Alabama, on 14 August 1982, Duncan observed many Yellow Warblers along the treeless part of Dauphin Island at mid-day, feeding as they moved west. On 8 August 1977, C. Dwight Cooley (pers. comm.) counted 24 birds and on 9 August, 33 birds, as they flew west from Ft. Morgan across the mouth of Mobile Bay toward Dauphin Island. They were in groups of two to four and were seen before 0900.

In Mississippi, on 21 August 1978, between about 0645 and 0830, Judith A. Toups (pers. comm.) counted 127 Yellow Warblers as they flew over her residence in Gulfport. The numerous call notes of this species heard just after sunrise indicated a sizable movement was underway. The count included only those seen in an arbitrarily established flight corridor (about 60 m wide and 25 m deep) and did not include birds heard but not seen. Heaviest movement occurred between 0730 and 0800. Birds flew in small groups, the maximum being 11 and most consisting of five or fewer individuals. The birds flew quite low, all in a west or southwest direction. On subsequent mornings, Toups noted small numbers at the same time and place, with a maximum of 19 on 22 August. At the Pascagoula River marsh, Toups, Weber and others observed 10 birds on 12 August 1978, 15 on 14 August 1978, and 10 on 2 September 1978, all flying west along the coastline, either singly or in groups of two to three and nearly all before 0900. Weber, Toups and Robert P. Russell noted similar but smaller movements there in 1977. Myers (pers. comm.) reported seeing "hundreds" of Yellow Warblers flying WSW across Bay St. Louis on 9 August 1961 and smaller numbers on 10 August.

In Louisiana, Myers (1961) noted that he and other observers had seen movements similar to those at Bay St. Louis in New Orleans and elsewhere in the state.

In Texas, at Hazel Bazemore County Park in Corpus Christi, Gene Blacklock has observed numbers of Yellow Warblers on many occasions beginning their migration shortly after sunrise. Movement was toward the south along the coast and on one occasion involved 100 birds (Charles T. Clark, pers. comm.).

The occurrence of diurnal migration is further supported by a relative absence of nocturnal casualties at the WCTV TV tower located 58 km inland near Tallahassee, Florida. Crawford's (1981) data show that in 25 years (1955-1980), considerably fewer Yellow Warblers (85) were retrieved in July, August and September than other early migrants such as Northern Parula (*Parula americana*) 392; Prairie Warbler (*Dendroica discolor*) 396; Northern Waterthrush (*Seiurus noveboracensis*) 436; Kentucky Warbler (*Oporonis formosus*) 355; Hooded Warbler (*Wilsonia citrina*) 424 and American Redstart (*Setophaga ruticilla*) 237.

Although age samples are small, migrant birds banded by Lucy Duncan at Gulf Breeze do not suggest an asynchronous diurnal-nocturnal migration pattern between adults and immatures. Of 44 Yellow Warblers banded during fall migration 1977-1982, 5 were adults, 33 were immatures and 6 were of unknown age. Of 18 Yellow Warblers retrieved from the WCTV TV tower in fall between 1973 and 1975, 4 were adults and 14 were immatures (Crawford 1978). The WCTV tower and Gulf Breeze are about 322 km apart and lie on the trans-Gulf flyway of migrant birds.

In summary, Yellow Warblers in substantial numbers move westward in August along the northern Gulf Coast strongly suggesting that at least part of the North American population is both diurnal and circum-Gulf in its fall migration. These data further indicate that some southbound birds retrace the spring route around the western Gulf as described by Stevenson (1957).

We are grateful to Judy Toups, Lucy Duncan, Dwight Cooley, Charles T. Clark and Robert P. Russell for letting us use their information. Bob Crawford's generosity in sharing his data with us is especially appreciated.

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Robert A. Duncan, 614 Fairpoint Dr., Gulf Breeze, Florida, 32561 and **Wayne C. Weber**, Department of Biological Sciences, Mississippi State University, Mississippi State, Mississippi, 39762. (Present address of Weber: 303-9153 Saturna Drive, Burnaby, British Columbia V3J 7K1, Canada).

Florida Field Naturalist 13: 20-22, 1985.

REVIEWS

The book of the Wild Turkey.—Lovette E. Williams, Jr. 1981. Tulsa, Oklahoma, Winchester Press. 181 pp., 32 color photos, 77 black & white photos, 11 maps. $19.95.—This pleasantly written book, with its helpful illustrations, is oriented toward sportsmen by a biologist who is himself a longtime devotee of turkey hunting. But this orientation should not deter birders. Most of Williams's book is about the natural history of Wild Turkeys, i.e., their distribution, habitat preferences, roosting, feeding habits, displays and calls of the gobblers, the nests of the hens, and the lives of the poults. Much of Williams's firsthand knowledge about the natural history of Wild Turkeys was gained in Florida while he conducted his long-term research at Fisheating Creek, Glades Co., and in the vicinity of Gainesville, Alachua Co. Thus this book is of special interest to Floridians.

The return of Wild Turkeys, one of the most successful of all re-stocking programs, is also dealt with. An early cause of failure was that turkeys liberated were crosses between wild and domestic birds. Once it was realized that only pure Wild Turkeys had the genetic makeup needed for survival, success was assured. What attributes make Wild Turkeys so successful? One is a large reproductive capacity. Hens can nest in their first year, lay about eleven eggs after a single mating, do not desert their well-hidden nests readily and will re-nest if a first nest is lost. "The Wild Turkey," continues Williams, "is a physically tough animal." It can survive sub-zero temperatures in the northern parts of its range and even go days without feeding. In addition to these attributes, the Wild Turkey may have the most varied diet of any animal known. In Virginia alone it has been noted as feeding on over 350 plants.

The last few chapters are on management and the art or science of turkey hunting, including a section on turkey calling. Although professionals oriented toward theory and statistics may find this book unsophisticated, work funded by game management agencies is pretty much concerned with practical problems. Within limits that he undoubtedly had to face, Williams has produced a biologically sound and instructive book.—**Lawrence Kilham**, Department of Microbiology, Dartmouth Medical School, Hanover, New Hampshire 03755.

Florida Field Naturalist 13: 22-23, 1985.

Cruickshank's photographs of birds of America.—Allan D. Cruickshank. 1977. New York, Dover Publications, Inc. x + 182 pp., 177 photographs. $6.00.—It is never too late to bring this fine book to your attention. Allan Cruickshank was probably America's foremost photographer of birds in black and white. His photographs were published in many magazines and books through the years and no doubt influenced the development of several generations of naturalists. This inexpensive, but well-made, large-format paperback includes 102 photographs from Cruickshank's "Wings in the Wilderness" (1947) and 75 additional photographs selected by his wife, Helen. She also wrote a new preface and captions for the photos new to this edition. Any bird-lover will find, as I have, many enjoyable hours of armchair birding in the pages of this book.

This book has a special interest for Floridians because 46 of the 177 photographs (three times more than any other state) were taken in Florida spanning 35 years (1937-1972) of Allan's career. Other localities for the photographs in this book include 14 states and one Canadian province. For those who want to annotate their copy of this book I list, for the Florida photographs, the locality of each photograph followed by the date and page number: "nd" indicates no date.

FLORIDA, 46 photos: Alafia Banks—1969-*30, 31*; Cocoa—1955, May-*108*; Daytona Beach—1965, November-*91*; Daytona, Halifax River—1945, January-*44*; Dry Tortugas—1953, May-*9*; 1954, May-*11*; 1955, May-*112*; Everglades National Park—1937-*8*; 1946-*26, 27, 28*; 1947-*18, 19, 20*; 1961, January-*72*; Florida Bay—1937, February-*10*; Gulfport—1946, February-*2*; Hobe Sound—nd-*147*; Horseshoe Beach—1946, April-*70*; Indian River—

1965, January-*51*; 1972, January-*86*; KISSIMMEE PRAIRIE—1937, February-*54*; 1941-*60*; January-*61*; 1947, February-*127*; April-*130*; LAKE OKEECHOBEE—1941, May-*69*; 1942-*29*; May-*56*; LAKE OKEECHOBEE, KINGS BAR REEF—1942-*29*; MELBOURNE CAUSEWAY—1970, March-*12*; February-*17*; MIAMI, HIALEAH RACE TRACK—1946, January-*35*; ORLANDO—1966, January-*50*; PORT CANAVERAL—1954, May-*118*; 1968, May-*77*; 1971, January-*15*; ROCKLEDGE—1968, May-*138*; ST. MARKS NWR—1958-*24*, *25*; TALLAHASSEE—nd-*175*; TAMPA BAY AREA—1946, January-*105*; 1947-*23*; WAKULLA—nd-*156* bottom, *157*.

I am grateful to Helen Cruickshank, not only for seeing this book to completion, but for providing me with the locality and date information tabulated above.—**Fred E. Lohrer**, Archbold Biological Station, Venus, Florida 33960.

Florida Field Naturalist 13: 23-24, 1985.

REPORT

Summary of the 1984 fall meeting.—West Palm Beach, Florida was the site of the fall meeting of the Florida Ornithological Society. Howard Langridge and the Audubon Society of the Everglades were our hosts from 5-7 October 1984. President Kittleson thanked the local committee for their work and announced the dates of the next spring meeting in Gainesville (19-21 April) and the fall meeting in Orlando (13-15 September). A Special Fund for the deposit of excess page charges of the Florida Field Naturalist was approved. This may see the Field Naturalist through an unforeseen emergency. Bob Crawford and Howard Langridge will serve as newly elected members of the Records Committee. Guidelines were presented by the Research Awards Committee and a Selection Committee was chosen. The deadline for application for a Research Grant is 15 February, and the maximum amount of a grant is $300.

There was a special meeting of the general membership and the revised Articles were approved. Mrs. Marlene Putman displayed her portrait of Allan Cruickshank to be placed on the Memorial Trail at Merritt Island in his memory by FOS. In appreciation Mrs. Cruickshank has donated $200 to the FOS Research Fund.

The following graduate students presented papers at the technical session: Lisa Hanners, "Sexual dimorphism of Laughing Gull chicks"; Stephen R. Patton, "Spatial distribution of foraging gulls at south Florida landfills"; Eva Jones, "Band wear and Sooty Tern longevity"; Kevin McGowen, "Another way of helping: sentinal behavior in Scrub Jays"; Jack Gardner, "Thermal behavior of Anhingas in south Florida"; and Tim Hargrove, "The role of semen preservation in avian conservation". Dr. Greg Harrison spoke on "The role of birds in veterinary medicine" and presented a video tape on "Rearing domestic psittacines".

Jeff Moore again prepared a bird song quiz and Bill Hardy identified most of his own recordings. The prize went to Peggy Powell who was one identification short of matching the expert. Glen Woolfenden won the skin quiz prepared by Shelia Mahoney. The prize for both winners was a photograph by Bill Bolte. Mr. Bolte and his wife Jan have traveled and photographed extensively, and at the banquet he presented a pictorial tour of Alaska.—**Marsha S. Winegarner**, 2360 Old State Road Eight, Venus, Florida 33960.

Florida Field Naturalist 13: 24, 1985.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 13, NO. 1 FEBRUARY 1985 PAGES 1-24

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 13, NO. 2 MAY 1985 PAGES 25-48

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The *Florida Field Naturalist* is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 13, NO. 2 MAY 1985 PAGES 25-48

BEHAVIOR OF AMERICAN CROWS IN THE EARLY PART OF THE BREEDING CYCLE

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Although Townsend (1923) makes a brief mention of allopreening and Townsend (1927) and Good (1952) of the bowing of American Crows (*Corvus brachyrhynchos*), much of crow behavior in the early part of the breeding cycle remains undescribed. It has been recently established that this species is a cooperative breeder (Kilham 1984a). Here I report on the dominance exerted by the breeding male of the cooperative group and describe details of allopreening, on the differences in behavior of breeding males and females, and on other aspects of behavior in the early breeding season. Copulatory behavior was described in a separate report (Kilham 1984b). The usual breeding season of crows in Florida extends from January into May.

METHODS AND STUDY SITE

I observed crows from January to May 1981-1984 at the Hendrie ranch, 24 km south of Lake Placid, Florida. The crows were tame because of years of protection and feeding and allowed me, at times, to observe them within 5-7 m. Although none was banded, I was able to recognize some individuals by their broken of missing rectrices or remiges or by peculiarities of vocalizations or behavior. Yearlings were identified using the method of Emlen (1936), particularly by the squarish outline of the tail, the worn appearance of rectrices and the general brownish cast of the plumage. I fed corn daily to keep track of the number of crows in two groups that I labeled A and B. Each defended a communal territory. Although this report is based on 4 years of observations, descriptions are centered on group A in 1984 because I was able to recognize most of its members.

Florida Field Naturalist 13: 25-31, 1985.

Observations

Dominance of breeding male.—The dominance exerted by breeding males was a feature of early breeding behavior. When I scattered corn in territory A in early January, eight crows came to feed. I identified the breeding male, MA, by both physical and behavioral characteristics. He did the most cawing and wing-tail flicking and was the last to approach the corn. When among the others he stood out by being heavier and broader, a size difference accentuated by his standing with head up and holding his "shoulders" out. While picking up corn he tried continually to edge away another crow (X), identifiable by a broken feather projecting vertically from the upper middle portion of its folded right wing. Since X was aggressive and drove away another crow, he also seemed to me to be a male. MA became increasingly intolerant of X during the study period. He initially walked behind in driving him away, but changed to attacking and pursuing by early February. On 14 February he supplanted X from 9 fence posts in succession. By the end of the month X ceased to appear and MA was driving another adult crow away.

By this time, I found that the size of group A varied according to where I scattered corn. If within 90 m of the nest that was being built, four crows of what I called the inner group, the breeding pair plus two yearlings, came down, but if at 200 m, seven crows gathered, the extras being adults. All groups followed much the same pattern in the 4 years of my watching, with an original group of 8-10 crows being reduced to an inner one of 4-6. This was until late incubation when the aggressiveness of breeding males declined.

Allopreening.—Female A was identifiable being about 5 cm shorter than her mate, a difference best seen when the two perched together, as well as in being the only one of her group to give G-dong calls, an individual peculiarity.

On 10 February I found MA and FA perched on a limb 5 m above my head. This was in the interim period of several weeks between completion of nest building and egg laying. When MA held his head low, she preened the feathers on the top. In the midst of this she put her bill under his to tip his head so that she could reach the feathers of his throat. MA closed his nictitans when she nibbled the feathers by his eye. FA paused at times to preen herself.

FA was on a canal bank giving G-dong vocalizations on another occasion when MA alighted near her. He picked up a rootlet and,

moving close, bent his head, still holding the rootlet as she allopreened him. After a few minutes he dropped the rootlet, picked up some fibrous material, then returned for more allopreening. She mounted a cow pie three times and preened the top of his head. Allopreening largely ceased during incubation. FA tried to preen a yearling when it came to feed her on incubation day 3 and when MA came, she preened him for 3 sec. The nest failed late in incubation and pair A did not renest. The pair reverted to allopreening in late March. Although nearly all allopreenings that I have watched were unilateral (n = 100+), they were occasionally reciprocal. Thus when MA came to feed his mate early in incubation, she allopreened him for a minute, standing on the nest rim to do so. She then settled on the nest and he allopreened her.

Holding objects in bill.—In addition to debris occasionally held in the bill at times of allopreening, breeding males sometimes picked up objects as part of copulatory behavior (Kilham 1984b). When a pair assumed precopulatory poses on the ground below their nest on 6 March, the male picked up a raccoon (*Procyon lotor*) vertebral column with pelvis and a femur attached and leaned it against his mate. Four days later when the female flew from her nest on what was her second day of incubation, the male performed a vigorous precopulatory display below the nest tree, then picked up the raccoon bones again. Some precopulatory displays were play-like. When pair A were on a canal bank near their nest 4 days before incubation began, MA picked up a wad of debris and walked to his mate. She immediately crouched in a precopulatory display. But MA, instead of mounting, lay on his side holding the debris toward her. Then he assumed a precopulatory pose and she attempted to mount him in a reverse mounting.

This "play" of the adults was, seemingly, mimicked to some extent by the two yearlings later on. When one picked up a lump of clay, it ran to its companion and lay down on its side. It stood up as the second yearling came behind and poked it on the back. At this the first one threw its head back as females do in copulating, while it still held the lump of clay.

Third crows.—A feature of all pairs of crows that I studied was the persistance with which they were attended by third crows. A third crow might be a yearling or, if there were no yearlings in the group, a nonbreeding adult. The third crow with pair A in 1984 was a yearling. On 12 February, when MA flew away after being allopreened, the yearling took its place and female A allopreened it

for 3 min. A few days later the yearling crowded close along the wire when FA was on a fence post. MA, returning, hovered, then settled between the two, forcing the yearling away. Although males drove older third crows away by rougher methods, such as pecking at their feet, MA never more than nudged the yearling. The yearling responded at times by holding its wings out in appeasement begging or, rarely, by holding a foot out sideways to keep the larger crow away. All third crows in 1982 were yearlings. Of episodes particularly noted (n = 29), a third crow tried to crowd in on the two of a pair when they were allopreening in five and when they were engaged in copulatory behavior in three. On 10 February a yearling flew to the nest immediately after a pair had copulated and tried to push its head under the two of them. On another occasion, when a pair was flying, the male tried to drive a third crow away without success. When the trio landed on a branch with little room, the third crow hung upside down below the pair. Begging cries, probably an appeasement behavior, were a frequent vocalization in all early breeding seasons.

Other behaviors in courtship.—Other forms of courtship included bowing, billing and exchange of low notes. The members of breeding pairs frequently rested within 5-6 cm of each other. While MA and FA might allopreen at these times, they several times (n = 3) bowed together, both facing out in the same direction. On 8 January MA, with head feathers raised and wings a little out, made a moaning sound, then a Cu-koo in bowing. FA also bowed, but less deeply. These joint performances were repeated six times. I saw similar bowing on 9 and 10 January. In 1982 what I believe was the same pair together on the back of a cow. One then tried to mount the other.

Bowing, however, is not only performed in courtship. When MA alighted at corn in February in the presence of rival male X, he assumed an upright posture with tail spread and wings a little out, then bowed deeply, giving a Cu-koo.

Billing was infrequent in courtship. When MA and FA came close to each other on 13 and 17 February, they fenced gently with their bills tips, with one grasping the terminal half of the bill of the other. Low notes were ones I heard particularly when the two of a pair settled together on nests prior to egg-laying.

Discussion

Because crows within a group do not usually supplant each other at food (Kilham 1984c), I suggest that the dominance displayed by breeding males may have led to social or sexual adjustments within groups that facilitated cooperative breeding, a concept discussed by Woolfenden and Fitzpatrick (1979) for Florida Scrub Jays (*Aphelocoma c. coerulescens*). An additional effect of male dominance, among the crows, was to reduce groups to a size and composition compatible with cooperative nesting in its early stages.

One breeding male, MA, was notably larger than any other crow in his group. Predominance in size would seem to be an asset to assertion of dominance. I have not been able to find much information on weights of American Crows. In Hartman's (1955) series of ten individuals of the Florida race *C. b. pascuus*, five males weighed more than the females. Holyoak (1970) found that male Carrion Crows (*C. corone*) could be as much as 12 percent heavier than females and have bills 8 percent larger.

Allopreening with females taking the lead has been described by Lorenz (1970) for the Jackdaw (*C. monedula*) and Common Raven (*C. corax*), by Schaller (1964) for the White-necked Raven (*C. albicollis*) Richards (1976) for the Rook (*C. frugilegus*) and Wittenberg (1968) for the Carrion Crow. Harrison (1965), in his review of allopreening, considers that birds doing the allopreening are dominant. In birds that I have studied, however, including Casqued Hornbills (*Bycanistes subcylindricus*) (Kilham 1956) and Crested Caracaras (*Polyborus plancus*) (Kilham 1979) as well as American Crows, I have found allopreening to be pair-bonding with no indication of one sex or the other being dominant. Both sexes appear to seek allopreening.

Trios are a curious feature of crow behavior. They are seemingly widespread for I have observed them in late fall and winter months in New Hampshire (unpublished data) as well as in Florida. Charles (1972), who noted the persistance with which "third birds" attended pairs of Carrion Crows in spite of efforts of breeding males to drive them away, thought that they were males. Dow (1970) describes a "ubiquitous trio" of a helper and a breeding pair of Noisy Miners (*Myzantha melanocephala*).

Bowing is common to a number of *Corvus* species (Goodwin 1976; Coombs 1978). Bowing is a display that can be used in both courtship and agnostic behavior. It is complicated, however, in being performed at times in solitude in no discernible context. Good (1952), who studied crows that were wary and could only be viewed at a distance, believed that they had little courtship behavior, a characteristic, possibly, of birds that are mated for life. But I have not found this to be true of birds that I have studied. Whether birds pair for life or come together for only a season, they still need courtship to synchronize sexual development as well as to insure the cooperation needed for raising young. With American Crows it is possible to miss much that goes on in the way of courtship unless one studies them at close range and in the absence of fear.

Summary

The courtship of a pair of cooperatively breeding American Crows includes allopreening, bowing, billing and exchange of low call notes. The breeding male appeared dominant over other crows in his territorial group. A phenomenon observed with all pairs was the presence of third crows that tried to attach themselves to mated pairs and were, at times, allopreened by the female. The dominance of breeding males, which took up much of their time in the early breeding season, appeared to be of value in establishing their sexual dominance.

Acknowledgments

I thank James N. Layne and Fred E. Lohrer of the Archbold Biological Station for assistance of various kinds, my wife Jane for aid in making observations and James H. Hendrie Sr. and John A. Hendrie for permitting my wife and me to visit their ranch.

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NOTES

Bobcat family utilizes tortoise burrow.—Florida gopher tortoises (*Gopherus polyphemus*) excavate long (3-15 m) burrows in well-drained soils and the excavated sand is pushed from the burrow to form a mound at the entrance. The burrows are sometimes curved, either around roots of other obstacles (Auffenberg 1969) or possibly due to the right or left footedness of the tortoise (Hansen 1963). They are known to offer shelter for numerous arthropods (Young and Goff 1939) and vertebrates in Florida including gopher frogs (*Rana areolata*), indigo snakes (*Drymarchon corais*), diamondback rattlesnakes (*Crotalus adamanteus*) (Conant 1958), opossums (*Didelphis virginiana*), foxes, and skunks (Auffenberg 1969). A striped skunk (*Mephitis mephitis*) was found in an unoccupied northern Florida tortoise burrow when it was excavated (Hallinan 1923). In southern Georgia, Landers and Speake (1980) report the frequent use of burrows by old field mice (*Peromyscus polionotus*), cotton mice (*P. gossypinus*), house mice (*Mus musculus*), and cotton rats (*Sigmodon hispidus*), and the enlargement of burrows for dens by cottontail rabbits (*Sylvilagus floridanus*), opossums (*Didelphis marsupialis*), striped skunks, raccoons (*Procyon lotor*), coyotes (*Canis latrans*), and foxes (*Vulpes vulpes, Urocyon cinereoargenteus*). During spring 1975 I observed a family of red foxes (*Vulpes vulpes*) occupy three tortoise burrows consecutively in about one ha of scrub 14 km south of Lake Placid, Highlands Co., Florida. At the third burrow the tortoise left when the foxes arrived; the first two appeared abandoned. In Utah one of the major predators of the desert tortoise (*Gopherus agassizii*), the kit fox (*Vulpes velox*), uses tortoise burrows in summer and winter (Coombs 1977).

Here I report the utilization of a tortoise burrow by three bobcat (*Lynx rufus floridanus*) kittens and their mother in the west section of the Archbold Biological Station, 12 km south of Lake Placid, Highlands Co., Florida. The female bobcat gave birth to her eighth litter (Winegarner and Winegarner 1982) in a den under a dense stand of saw palmetto (*Serenoa repens*). The den was bordered on the west by a temporary pond in a firelane and otherwise surrounded by scrubby flatwoods dominated by sand live oak (*Quercus geminata*) and saw palmetto. The kittens were born in early August 1982, and I heard them at the natal den until 28 August. When I returned on 4 September at 0840, I found them 14 m away at a tortoise burrow. I heard calls of a kitten coming from the edge of the mound at the entrance of the burrow, and I watched as the adult female approached this kitten and began to groom it. When the adult moved to the center of the entrance, she gave a low "Meow" and two more cubs ran out of the burrow. She greeted them with licks to the face and shoulders. Grooming and play behavior continued until 0940 when the adult half entered the burrow head first, loudly purring. All three cubs walked past the adult into the burrow, afterwhich she backed out. The kittens came out after her and more greeting behavior ensued. My experience with bobcat behavior led me to believe the adult was returning from a hunting foray. I

left the area at 1015. That evening 2.3 cm of rain fell, and the next day by 0730 I found fresh tracks of the adult female leading away from the area alone, but I did not see the cats. Five centimeters of rain on 6 September cleared old tracks, and the family group had moved south to a new site.

During my observations of bobcats using the burrow, I saw no tortoise tracks there. Although it has been suggested that bobcats could prey on young and old tortoises (Woodbury and Hardy 1948), in the ten years I have been examing bobcat scats I have seen no evidence of tortoise in their diet and no actual reports were found in the literature. Thus I believe the bobcats I observed were exploring the burrow and found shelter.

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Florida Field Naturalist 13: 32-33, 1985.

Collection date for the first Florida specimen of the Thayer's Gull.—We recently reported on collection of the first Florida specimen of the Thayer's Gull (*Larus thayeri*) (Stevenson and Atherton 1984, Fla. Field Nat. 12: 99-103. We subsequently have discovered that the published sighting and collection dates of this specimen were incorrect. The gull was first seen at Port St. Joe, Gulf County, on 11 June 1983 and collected on 12 June 1983.—**Henry M. Stevenson**, Tall Timbers Research Station, Rt. 1, Box 160, Tallahassee, Florida 32312 and **Lyn S. Atherton**, Box 58124, Tierra Verde, Florida 33715-8124.

Florida Field Naturalist 13: 33, 1985.

Nocturnal foraging of Yellow-crowned Night Herons in the Bahamas.—Detailed observations of nocturnal foraging of the Yellow-crowned Night Heron (*Nycticorax violaceus*) are not to be found in the literature, though this species commonly feeds at night (Kushlan 1978, Riegner 1982a). I observed several Yellow-crowned Night Herons foraging during November and December, 1978 on San Salvador (Watlings) Island, The Bahamas. I watched herons from two palm-thatch blinds, a burlap blind, and a rooftop, all of which bordered an expansive lawn in front of the San Salvador Coast Guard Station. Because the lawn received dim light from nearby buildings, I was able to watch foraging herons with reasonable clarity, though not well enough to identify most prey items. I do not know whether the artificial lighting helped herons to locate prey, but this seems likely.

The Yellow-crowned Night Herons I observed typically adopted both "upright" and "erect" postures while employing "standing" foraging behavior (terminology that of Kushlan 1976, 1978). All foraging appeared to be visual; I often noted the neck posture "head tilting" as herons scanned the ground for prey. Herons exerted "bill thrusts" and used "pecking" followed by "grasping" of very small prey items, probably insects, which were quickly swallowed. As did Riegner (1983), I observed herons widely foraging using the "walking slowly" behavior. "Upright" and "crouched" postures were employed equally often during walking. Unlike previous workers, I observed intermittent "running" on four occasions while herons were widely foraging. Because running never resulted in the actual capture of prey, I am uncertain as to whether it was a true component of the foraging repertoire. Most previous studies of Yellow-crowned Night Heron foraging behavior have been of birds wading in water. Running may be more common among terrestrially-feeding birds and should be watched for in the future.

By day, Yellow-crowned Night Herons on San Salvador, as elsewhere (Riegner 1982b), feed largely on crabs, according to the island residents I interviewed. In the winter, however, crabs become relatively scarce on San Salvador and insects appear to be the major component of the diet. On one occasion I observed the capture of a lizard, approximately 10 cm in length, by a heron foraging beneath a lighted streetlamp. After seeing the lizard, the heron remained motionless except for occasional quick jerks of the head and neck in the direction of the prey. The summation of jerks over nearly one minute resulted in a ratchet-like inching forward of the head to within 30 cm of the lizard. After pausing several more seconds, the bird thrust downward at about a 45° angle, immediately pulling back with the lizard in its bill; the lizard was soon swallowed head first.

In summary, my observations support Riegner's (1983) assertion that "the Yellow-crown's flexibility in foraging behavior provides a partial explanation for the occurrence of this heron in diverse habitats. . . ." Nocturnal observations of Yellow-crowned Night Herons and other species would be easier with the aid of a night vision device or light-emitting tags attached to birds under study (Batchelor and McMillan 1980, Clayton et al. 1978, Lehner 1979).

I thank D. Blockstein, V. Cervenka, K. Erickson and R. Miller for various forms of assistance. Eschewal of obtuse obfuscations is due largely to the helpful criticisms of J. Fitzpatrick and R. Timm, both of whom I also thank.

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Florida Field Naturalist 13: 34-35, 1985.

Red-winged Blackbird nest usurpation by rice rats in Florida and Mexico.— The rice rat (*Oryzomys palustris*) is known to use a variety of materials in constructing its nest (Negus et al. 1961) in marshland areas, though it seems primarily to use various grasses (Hamilton 1946, Worth 1950). Several other marshland-breeding animals also use grasses in nest construction, which might offer rice rats the opportunity to pilfer or reuse materials from some other nest, rather than collect new materials. In this note we report the use of Red-winged Blackbird (*Agelaius phoeniceus*) nests by rice rats in southern Florida and in Veracruz, Mexico.

On 5 May 1982, in Dade County, Florida, we observed a Red-winged Blackbird nest next to a drainage ditch. It contained a single egg and was constructed of intertwined blades of grass located approximately 1.3 meters above the ground in a wax myrtle bush (*Myrica cerifera*). When we revisited the nest the next day, the bottom lining of the nest had been pushed or pulled up and reworked to form a plug over the nest cup's opening, creating a roughly spherical structure with an enclosed central chamber. The single egg was missing.

The chamber contained four young rodents that we tentatively identified as recently born rice rats. The identification was later confirmed by J. N. Layne (pers. comm.) from photographs of the young and through comparisons with illustrations in Lowery (1974). Although we carefully reconstructed the nest after examining the young, they were missing when the nest was rechecked the next day.

On 5 June 1983 in marshes around the Papaloapan River in the state of Veracruz, Mexico, we found another Red-winged Blackbird nest containing three young rodents that we identified as rice rats. The nest was constructed of grasses and was approximately 2 meters above the ground in cattails (*Typha* sp.). We found the nest after it had been abandoned by the Red-winged Blackbird and therefore could not determine its status when taken over by the rats. The nest had been altered in the same manner as the Florida nest. When we visited the nest the next day, the rats were still there.

Bancroft (1983) noted that rice rats usurped the nests of Boat-tailed Grackles (*Quiscalus major*) and that rats accounted for a large portion of the egg and nestling predation at some of his study sites. Kale (1965) also noted that nestling Marsh Wrens (*Cistothorus palustris*) were occasionally taken by rice rats, though he did not describe instances of wren nests being used by rats for nesting. The occurence of this nest usurpation in different bird species and in two widely separated locales indicates that this behavior may be a common activity of rice rats. In any event, these represent interesting cases of interspecific nest use.

These observations were made while we were working on research projects funded by the National Geographic Society and the National Science Foundation (DEB 7922995) through grants to F. C. James. We thank an anonymous reviewer for helpful comments.

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Florida Field Naturalist 13: 35-36, 1985.

First Gulf Coast record of the Bar-tailed Godwit.—On 23 April 1983, the authors and Steve Howell observed a Bar-tailed Godwit (*Limosa lapponica*) on a sand spit opposite the Florida State University Marine Lab near Turkey Point, Franklin County, Florida. The godwit rested with a flock of 15 Marbled Godwits (*L. fedoa*) and 45 Willets (*Catoptrophorus semipalmatus*) near the high tide line. We observed it under excellent light conditions (1400) with binoculars and spotting scope at distances down to 15 m for 10 minutes. We then deliberately flushed the bird to observe its wing and tail pattern. The bird was in basic plumage and the following field marks were noted and discussed during the observation period: (1) "obvious" godwit bill, slightly upturned,

dark distally, dull pink proximally; (2) short stature compared to nearby Marbled Godwits, about the size of the largest Willets (probably western race) present in the flock; (3) dorsally streaked, not barred; (4) venter very pale grayish-buff with a darker wash across breast; (5) wing linings white, not black, gray or cinnamon; (6) rump pale, tail finely barred; (7) no wing stripe; (8) legs dark gray. This combination of field marks eliminates other godwits and all other shorebird species from consideration.

Henry and James Stevenson saw a godwit at the same location on 25 April and agreed with our identification. It was not seen on subsequent visits. This sighting coincided with passage of a storm front with strong westerly winds that brought numbers of Mississippi Valley migrants (e.g., Dickcissel *Spiza americana*, Painted Bunting *Passerina ciris*) to the northern Gulf Coast of Florida.

This sighting constitutes the first record of the Bar-tailed Godwit for the Gulf Coast and only the second record for the southeastern United States south of North Carolina (1971, Amer. Birds 25: 44-49; 1972, Amer. Birds 26: 45-50; 1975, Amer. Birds 29: 40-43).—**Gary R. Graves**, Department of Biological Science, Florida State University, Tallahassee, Florida 32306 (present address of GRG: Division of Birds, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560); **Robin M. Carter**, 8484 16 St. #505, Silver Springs, Maryland 20910; and **Cathleen C. NeSmith**, Department of Biological Science, Florida State University, Tallahassee, Florida 32306.

Florida Field Naturalist 13: 36-37, 1985.

First peninsular sighting of Vireo olivaceus flavoviridis in Florida.—On Hypoluxo Island, Palm Beach County, Florida, I observed a *Vireo olivaceus flavoviridis*, a bird formerly known as the Yellow-green Vireo, but recently determined to be conspecific with the Red-eyed Vireo (*Vireo olivaceus*) (AOU 1983). One individual was found in the front yard of a private residence in a sparsely foliated gumbo tree (*Bursera simaruba*) in company with a Black-whiskered Vireo (*Vireo altiloquus*). I first observed it on 25 May 1984 at a distance of 15 m from 0810 to 0813. On 26 May 1984 under similar conditions and in the same tree, Robert Flores, Wally George, Brian and Joan Hope, Gloria Hunter, Paul Sykes and I confirmed my identification.

This bird had a vireo bill with some flesh color in the lower mandible, a gray cap, a faint superciliary line with no black over or under it, a very white throat, light gray breast, bright yellow undertail coverts and flanks and sides that extend above the bend of the wing, and yellow-green upperparts.

I am aware of the pitfalls in identifying this subspecies in that every fall I see a few migrating immature Red-eyed Vireos with yellowish undertail coverts and some birds even with yellowish on the lower flanks. However, the distinctive plumage of this individual convinced the observers that it was a *V. o. flavoviridis*.

The sighting of this race is the first published for peninsular Florida and the fourth for the state. The first three Florida records occurred at Pensacola. On 4 May 1958 at Pensacola, Santa Rosa County, Burt Monroe, Jr., Francis M. Weston and Lyman Goodnight collected a male for the first state record. This specimen was deposited in the Louisiana State University Museum of Zoology collection (LSU 22492) (Monroe 1959). On 11 May 1958 at Pensacola the same party saw a second bird (Monroe 1959). Francis M. Weston sighted

the third bird on 18 April 1960 at Pensacola (Weston 1965).

V. o. flavoviridis breeds from the Rio Grade delta southward to Panama (Oberholser 1974) occasionally wandering into California, New Mexico and Arizona. Aside from the four Florida records, the only spring occurrence of *flavoviridis* in North America east of Texas was a bird collected on 18 May 1883 at Godbout, Quebec (AOU 1957). The presence of the Hypoluxo Island bird so late in May and so far south or east of any previously known occurrence is as puzzling as the Quebec record.

I thank C. Wesley Biggs and Paul Sykes, Jr., for furnishing reference materials.

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Florida Field Naturalist 13: 37-38, 1985.

Continued scolding by parent birds after nest predation by crows.—Several hypotheses have been offered as to the function of predator mobbing by breeding birds. Curio (1975) considered that its main function is to cause the young to remain still and less obvious while the adults distract the predator. Hinde (1954), Kruuk (1976), and Skutch (1976) suggested that mobbing may be an expression of curiosity or be an attempt to obtain or convey to young information about the predator. Bourne (1977) and Fry (1977) hypothesized mobbing may be a "hue and cry" attempt to enlist aid from a predator of the marauder in discouraging the nest predator. The duration of adult birds' mobbing activities has seldom been recorded because the human observer is usually attracted to the site by the sounds of mobbing when the event is well in progress and leaves shortly after the predator does (Pettingill 1976, Bourne 1977, Lohrer 1980, Webber 1980). Only infrequently have there been records of scolding by defending birds after the predator leaves, an after-stimulus response (Taylor 1972, Best 1974, Curio 1975, Pettingill 1976, Finch 1981). Quite often an author has merely stated that the adult birds scolded (Best 1974, Pettingill 1976, Finch 1981).

In this paper I present observations of nest predation on Northern Mockingbirds (*Mimus polyglottus*) by a Fish Crow (*Corvus ossifragus*) and on Blue Jays (*Cyanocitta cristata*) by a Common Crow (*Corvus brachyrhyncos*) accompanied by prolonged after-stimulus responses, and I suggest possible functions of after-stimulus response.

At 1447 on 1 May 1983, I was attracted to loud mobbing noises in the vicinity of a Northern Mockingbird's nest in a yard in Tampa, Hillsborough County, Florida. The nest contained four two-day old nestlings. Less than two

minutes earlier I had noted an adult brooding on the nest, but saw no predators in the area. A Fish Crow was standing on the nest branch in the 6 m oak (*Quercus* sp.) while three mockingbirds and four Blue Jays flew at it scolding loudly. The crow then removed two young from the nest. As the crow hopped to the periphery of the tree, a Blue Jay pecked it strongly on the back of the head. Six of the mobbing birds chased the crow closely about 75 m as it flew from the area. All birds but the crow returned to the nest after the chase.

Individual mobbing birds stayed within 3 m of the nest tree gradually reducing the intensity of scolding and leaving the area 10-14 min following the crow's departure. The adult mockingbirds scolded me 30 min after the incident when I stepped out of the house to examine the nest at a distance of 30 m with a binocular. At 1900 that evening the nest was empty and no adult birds were present.

A second instance of after-stimulus response occured on 11 April 1984. At 1832 I observed three Blue Jays scolding and attacking a Common Crow about 2 m below the top of a 20 m white pine (*Pinus strobus*) in Westerleigh, Staten Island, New York. A jay struck the crow on the back, the crow dropped something, fell about 1 m, recovered and flew out of the tree to the south. As the crow flew, two or three neighboring jays began to scold but did not chase the crow. The crow flew to an undetermined destination and did not return.

The jays of both groups scolded intensely, 7-12 calls per 10 sec, for 3 1/3 min. The rate of scolding tapered off to 0-5 calls per 10 sec over the next 4 min. The jays that had attacked the crow alternated scolding with the jays to the south, which had no interaction with the crow that I observed. By 1840 the birds had ceased scolding. At 1915 the jays were resting for the night as the sky was overcast, and it had become quite dark.

Below the tree in which the crow had been attacked, I located a freshly broken, yolk-stained Blue Jay egg but could not determine the stage of incubation. Two newly fledged jays were observed in the same tree 16 May 1984, presumably from this nest.

Many have noted the apparent ineffectiveness of mobbing and attack by adult birds on marauding birds (Taylor 1972, Pettingill 1976, Finch 1981, Shedd 1982), mammals (Hemmetzinen 1971, Kruuk 1976, Pettingill 1976), and snakes (Best 1974, Pettingill 1976, Bourne 1977, Lohrer 1980, Webber 1980, Finch 1981). Predators usually remove all young or eggs from nests at one time or by rapidly returning unless interrupted or thwarted (Taylor 1972, Best 1974, Pettingill 1976, Bourne 1977, Lohrer 1980). The Fish Crow reported here was seen to remove only two mockingbird nestlings, but two others were removed within 3 1/2 hr after I stopped watching the nest.

Sometimes mobbing has been shown to be effective in preventing nest predation (Nolan 1959, Taylor 1972, Smith and Holland 1974, Pettingill 1976, Webber 1980). The effectiveness is enhanced by circumstances such as inclement weather (Taylor 1972), the onset of darkness (this paper), human interference (Best 1974, Bourne 1977, Webber 1980), and possibly predators of the nest predator (Bourne 1977, Fry 1977). It is often the case, however, the nest may be emptied at some later date (Best 1974, Pettingill 1976, Webber 1980, Finch 1981).

Curio's review (1975) considered after-stimulus response an "inertial neural overflow response", a decrementing neuronal triggering of motor function that continues after the stimulus is removed, but he did not examine its

function as he did for mobbing (Curio 1978). Some functions of after-stimulus scolding may be: 1) to convey to a returning predator that there are adult birds prepared to defend the nest or young and 2) to maintain a heightened state of vigilance on the chance the predator should return. A negative feature of after-stimulus scolding is the possible attraction of other predators to the nest site.

Pettingill (1976), Lohrer (1980), and Finch (1981) noted snakes often wait several hours or days before returning to partially emptied nests. Adult birds do not continue to scold after these predators leave, but quickly resume care of the eggs or young. I have observed (unpubl. data) if a potential predator moves through a nesting bird's territory but does not disturb the nest, the birds usually mob intensely during the predator's stay, but either do not show any after-stimulus response (n=30) or exhibit a short after-stimulus response lasting less than 30 sec (n=12). After-stimulus response, possibly as an inertial overflow activity (*sensu* Curio 1975), would serve little purpose in these circumstances.

When confronted with an avian or mammalian predator that could return to the nest quickly, birds might profitably prolong a mobbing response after the predator leaves if there is a probability of preventing the predator's return. In the case of the Common Crow reported here, the Blue Jay's mobbing and attack apparantly caused the crow to be unsuccessful in obtaining prey at the first visit. The after-stimulus scolding that followed may have further reinforced the crow's lack of success and deterred it from making a second attempt on this nest.

I thank James A. Kushlan and two anonymous reviewers for reading an earlier version of this paper and offering suggestions for its improvement.

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WEBBER, T. A. 1980. Eastern coachwhip predation on juvenile Scrub Jays. Fla. Field Nat. 8: 29-30.

Albert E. Burchsted, College of Staten Island, Department of Biological sciences, B-204, 715 Ocean Terrace, Staten Island, New York 10301.

Florida Field Naturalist 13: 38-41, 1985.

Adult Bald Eagle killed by another eagle.—At about 0730 on 19 December 1983, Assistant Park Manager Greg Toppin observed an adult Bald Eagle (*Haliaeetus leucocephalus*) lying on its side next to the main drive within Jonathan Dickinson State Park, Martin County, Florida. Another adult Bald Eagle was standing on top of it, and a third adult was perched in a nearby tree. As Toppin approached to get a closer look, he observed that the eagle was tearing feathers from the head of the bird on the ground. The bird on top then flew off and an examination found that the bird on the ground was freshly dead. It had a large flesh wound along one side of the head and blood and feathers were scattered around the body. A careful inspection of the site revealed no marks to indicate that the dead eagle might have been struck by a vehicle and no road kills were found that might have attracted it to this location.

The bird was transported to Lake Worth for a preliminary examination by Greg Harrison, a veterinarian experienced with birds of prey. Dr. Harrison found the bird to be an adult female in excellent condition with multiple chest wounds, which could have been caused by talons, severe damage to the head, and wounds along the neck. An x-ray showed that the skull was fractured, but no other bones broken. There was no evidence that the bird had been shot.

The carcus was then shipped to the National Wildlife Laboratory in Madison, Wisconsin, where it underwent more thorough examination. This detailed necropsy concluded that death was due to trauma, wounds received from other eagles. Multiple puncture wounds were found on the upper breast. The breast and abdomen had been denuded of feathers. The head had large puncture wounds at the ramus of the temporal mandibular joint. The left occipital area also had a large puncture wound, and there were multiple hemorrhagic spots and puncture wounds along the back of the neck. The left posterior and superior portion of the head was also denuded of feathers. Internal examination disclosed no significant damage to the cardiovascular and respiratory systems. The largest ovarian follicle measured about 10 cm in diameter.

As the dead bird was found approximately two and a half kilometers from an active bald eagle nest within the park, there was concern that it might be

one of the adults using this nest and that there might be eggs remaining in the nest. (The preceding year two eagles were raised at this location.) In that two adult eagles were observed later in the day near this nest, it was concluded that the dead bird may have intruded into their territory. Perhaps this triggered the confrontation and an aerial battle between two or three eagles in which one bird was killed either by the other bird(s) or by a fall to the ground. Although aggressive behavior between adult eagles is seen rather frequently, this is the only Florida record I know of in which an aggressive encounter apparently resulted in the death of one of the individuals involved.

I thank Fred Lohrer for his helpful comments on an earlier draft of this note.—**Richard E. Roberts**, Division of Recreation and Parks, Department of Natural Resources, P. O. Box 8, Hobe Sound, Florida 33455.

Florida Field Naturalist 13: 41-42, 1985.

REVIEWS

A guide to bird behavior, volume I.—Donald W. Stokes. 1979. Boston and Toronto, Little, Brown and Company, 336 pp., $8.95 paperback; and **A guide to bird behavior, volume II.**—Donald W. Stokes and Li lian Q. Stokes. 1983. Boston and Toronto, Little Brown and Company, 334 pp., $14.95 cloth.—Publication of volume II provides an opportunity to review the set, as no previous review of the first volume has appeared in The Florida Field Naturalist. First, one should note that these books are *not* by the author of Handyguide to the Coral Reef Fishes of the Caribbean (by F. Joseph Stokes), despite remarkable similarity in size, covers, bindings and authors' names. Donald Stokes has, however, written a guide to nature in winter, one on observing insects, and a natural history of shrubs and vines. The present volumes are the first-ever field guides to behavior-watching in any group of animals insofar as I am aware.

The two volumes are similar in format, beginning with general introductory material, followed by specific accounts of about two dozen common North American avian species, and concluding with a glossary and separate bibliographies for each species' account. Volume II has a sort of appendix ("checklist of nests and displays") but neither book, alas, contains an index. The introductory material is disappointing, although somewhat helpfully expanded in the second volume. Here a "summary of maintenance behavior" is provided, ostensibly because it is "very similar in all species" (not entirely true) and so omitted from individual accounts. "Eating" is confusingly included in maintenance activities (which are preening, stretching, oiling, scratching and so on), yet differences among species are emphasized, thus immediately belying the foregoing assertion of great similarity. Statements such as "you can look at a new bird and guess what it eats, simply by looking at its bill" is certainly nonsense, and the account of preening is misleadingly oversimplified. Troubles continue with the section on "behavior at your feeder," where the text asserts that few animals fight over food (not true), that songbirds and passerines are the same thing (the former are a subset of the latter), that crest-raising occurs when two birds land near each other (sometimes, in some species), that

wing-drooping is a display (it is not), and that the last of "four aggressive displays" is "not exactly a display" after all.

The species' accounts follow a set pattern: a full-page watercolor of the species (reproduced in black-and-white), brief introductory remarks, a "behavior calendar," a "display" guide and "behavior descriptions" subdivided by categories. In general, the portraits (by J. Fenwick Lansdowne in volume I and John Sill in volume II) are fine, but rarely illustrate specific behavioral patterns. The species' accounts are the hearts of the volumes and therefore deserve close attention.

The accounts in volume I are not bad, but the knowledgeable reader keeps stumbling on apparent errors of commission and omission. Why is the famous "red-shouldered hawk call" of the Blue Jay missing from the list of vocalizations (pp. 141-142)? Does the incubating female really receive "all of her food from the male"? Why, in the account of vocalizations of the Black-capped Chickadee, did the author change the names of the vocalizations from the original work by M. S. Ficken et al. (which is probably the most complete vocal repertoire ever compiled on an avian species)? Indeed, the account seems influenced by the monograph of S. T. Smith, which is on the Carolina Chickadee! The drawing of the wing-flashing Northern Mockingbird (p. 190) is incorrect, and this behavioral pattern is cited as a display (which is unproven) while failing to mention its established use in flushing insect prey. The account of pre-copulatory behavior of the European Starling (p. 231) is incorrect in asserting that only pecking of the male by the female is known; reverse mounting has been described in the literature.

If the species' accounts in volume I raise eyebrows, those in volume II elicit groans. I took the account of the Brown Thrasher as a sample, finding the only "visual display" listed to be wing-fluttering by the female—which is asserted to be a courtship display whereas the only descriptions in the literature assign it to immediate invitation to copulation. Audubon's (1841) description of male courtship strutting, quoted in Bent (1948), is not mentioned, nor is the specific singing posture of the male. The text says in one place that males arrive on the breeding grounds before females, but later admits that in southern states the species is a permanent resident. The behavior calendar has a blank for flocking behavior, which will come as a surprise to anyone who has participated in Christmas Counts in the middle Atlantic states. Nowhere does the text warn that this is a furtive species, and that the supposed "very few signs of courtship and pair formation" are almost certainly due to lack of good observations rather than lack of behavior by the birds.

The accounts in volume I are better, I believe, because the best-studied species were chosen and the literature was easily accessible. The lesser studied species of volume II require more thorough literature searches, which effort seems lacking. Still, these books constitute a pioneering effort to make avian behavior accessible to all observers. Using them as guides is somewhat like taking Audubon's (1840) Birds of America into the field for species' identifications: it helps, but not as much as one would like. Still, if the books convert the reader to a confirmed behavior-watcher, then the purchase price will have been more than justified.—**Jack P. Hailman**, Department of Zoology, University of Wisconsin, Madison, Wisconsin 53706.

Florida Field Naturalist 13: 42-43, 1985.

FLORIDA BIRDS IN THE PERIODICAL LITERATURE

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This list contains 57 citations to recent (1981-84) articles about Florida birds excluding those published in the Florida Field Naturalist. Authors are encouraged to send reprints of their articles to the compiler for inclusion in this annual feature.

Anonymous. 1984. News and notes. Chair of Ornithology at the University of Miami changes hands. Condor 86: 100-101.

Bancroft, G. T. 1984 Growth and sexual dimorphism of the Boat-tailed Grackle. Condor 86: 423-432.—Hillsborough and Pinellas co.

Bancroft, G. T. 1984. Patterns of variation in size of Boat-tailed Grackle *Quiscalus major* eggs. Ibis 126: 496-509.—Hillsborough and Pinellas co.

Becker, J. J. 1984. Additions to the late Pleistocene avifauna of Bradenton, Manatee County, Florida. Florida Sci. 47: 203-204.

Bock, C. E. 1984. Geographical correlates of abundance vs. rarity in some North American winter landbirds. Auk 101: 266-273.—Includes Florida Christmas Bird Count data.

Bohall, P. G., and M. W. Collopy. 1984. Seasonal abundance, habitat use, and perch sites of four raptor species in north-central Florida. J. Field Ornithol. 55: 181-189.—Northern Harrier, Sharp-shinned Hawk, Red-tailed Hawk, and Red-shouldered Hawk in 9 counties.

Brietwisch, R., P. G. Merritt, and G. H. Witesides. 1984. Why do Northern Mockingbirds feed fruit to their nestlings? Condor 86: 281-287.—As studied on Univ. Miami campus, Dade Co.

Burger, J., and M. Gochfeld. 1984. The effects of relative numbers on aggressive interactions and foraging efficiency in gulls: the cost of being outnumbered. Bird Behav. 5: 81-89.—Includes observations at dumps in Florida, Texas, and New Jersey.

Carr, A. 1983. Triple clutches. Anim. Kingdom 86(2): 46-49.—Includes observations of Florida Fish Crows digging up and carrying off fresh-water turtle eggs.

Christman, S. P. 1984. Breeding bird census. No. 171. Gulf of Mexico barrier island. Amer. Birds. 38: 119-120.—Franklin Co., St. Vincent island NWR-SE tip of island.

Connor, H., R. W. Loftin, and J. Wilson. 1984. Winter bird-population study. No. 69. Barrier beach and salt-water estuary. Amer. Birds 38: 56.—Duval Co., N. side of St. Johns River.

CONOVER, M. R. 1984. Occurrence of supernormal clutches in the Laridae. Wilson Bull. 96: 249-267.—Table on clutch size includes Florida data for Laughing Gulls and Sooty Terns.

COX, J., AND F. C. JAMES. 1984. Karyotypic uniformity in the Red-winged Blackbird. Condor 86: 416-422.—Includes samples from Colorado, Minnesota, and Dade and Leon co., Florida.

CRAWFORD, R. L., AND H. M. STEVENSON. 1984. Patterns of spring and fall migration in northwestern Florida. J. Field Ornithol. 55: 196-203.—Compares results from Leon Co. TV-tower kills (25 yr) with field-count study (23 yr).

CRIVELLI, A. J., AND R. W. SCHREIBER. 1984. Status of the Pelecanidae. Biol. Conserv. 30: 147-156.—Includes discussion of *Pelecanus occidentalis* in Florida.

DENNIS, J. V. 1983. Dispersal of Nantucket birds. N. Amer. Bird Bander 8: 2-5.—Of 91 recoveries of birds banded on Nantucket, 2 from Florida (Gray Catbird, Song Sparrow).

DIMMICK, R. W., F. E. KELLOG, AND G. L. DOSTER. 1982. Estimating Bobwhite population size by direct counts and the Lincoln Index. Proc. Natl. Bobwhite Quail Symp. 2: 13-18.—In Florida and Tennessee.

DOSTER, G. L., et al. 1982. Hunter success and crippling losses for Bobwhite Quail. Proc. Natl. Bobwhite Quail Symp. 2: 45-47.—In Florida.

EDMAN, J. D., J. F. DAY, AND E. D. WALKER. 1984. Field confirmation of laboratory observations on the differential antimosquito behavior of herons. Condor 86: 91-92.—Everglades Natl. Park, Dade Co.

ENGSTROM, R. T., AND F. C. JAMES. 1984. An evaluation of methods used in the Breeding Bird Census. Amer. Birds 38: 19-23.—Compares results from pine forest in southern Georgia with magnolia-beech forest at Tall Timbers Res. Sta., Leon Co.

ENGSTROM, R. T., R. L. CRAWFORD, AND W. W. BAKER. 1984. Breeding bird populations in relation to changing forest structure following fire exclusion: A 15-year study. Wilson Bull. 96: 437-450.—At Tall Timbers Res. Sta., Leon Co.

FLEMING, W. J., J. A. RODGERS, JR., AND C. J. STAFFORD. 1984. Contaminants in Wood Stork eggs and their effects on reproduction. Florida, 1982. Colonial Waterbirds 7: 88-83.—Eggs collected from 8 central and northern Florida colonies.

FORAN, S. 1984. Florida's little falcon. Fla. Wildlife 38(2): 14-17.—Popular account of decline of *Falco sparverius paulus* in northern and central Florida.

GRAHAM, F., JR. 1984. Mystery at Dog Island. Audubon 86(2): 30-33.—Account of major loon die-off on Panhandle shores and of autopsy results from Natl. Wildl. Health Lab., Madison, Wisc.

GREENWOOD, J. G. 1984. Migration of Dunlin *Calidris alpina*: a worldwide overview. Ringing and Migration 5: 35-39.—Includes records of bird banded in Florida and recovered in Michigan (dates not given).

HENNEMANN, W. W., II. 1984. Spread-winged behaviour of Double-crested and Flightless cormorants *Phalacrocorax auritus* and *P. harrisi*: wing drying or thermoregulation? Ibis 126: 230-239.—Studies at Seahorse Key, Gainesville, and Galapagos Islands.

HOFFMAN, W., AND G. T. BANCROFT. 1984. Molt in vagrant Black Scoters wintering in peninsular Florida. Wilson Bull. 96: 499-504.

HOLMAN, J. A., AND C. J. CLAUSEN. 1984. Fossil vertebrates associated with Paleo-Indian artifacts at Little Salt Springs, Florida. J. Vert. Paleontol. 4: 146-154.—Remains, dated 12,000 yrs BP, include those of a Wood Stork, cf. *Mycteria.*

JAMES, F. C., et al. 1984. Inferences about population movements of Red-winged Blackbirds from morphological data. Amer. Midl. Natur. 11: 319-331.—Florida samples from Tallahassee, Leon Co., and Gainesville, Alachua Co.

JOHNSON, F. A., AND F. MONTALBANO, III. 1984. Selection of plant communities by wintering waterfowl on Lake Okeechobee, Florida. J. Wildl. Manage. 48: 174-178.—Twelve species of ducks at Fisheating Bay.

KAUFMAN, K. 1984. Identification of two potential Florida vagrants. Birding 16: 112-114.—Greater Antillean Pewee, and Bahama Yellowthroat.

KELLOG, F. E., ET AL. 1982. Efficiency of dogs in locating Bobwhites. Proc. Natl. Bobwhite Quail Symp. 2: 31-34.—In Florida.

KILHAM, L. 1984. Cooperative breeding of American Crows. J. Field. Ornithol. 55: 349-356.—As studied in Highlands Co.

KILHAM, L. 1984. American Crows robbing Great Egrets and White Ibis of large, eel-like salamanders. Colonial Waterbirds 7: 143-145.— In Highland Co.

KING, B. 1984. Flocks of gannets with other seabirds scavenging at shrimp boats off the coast of Florida. Sea Swallow 33: 64-65.—Near Daytona Beach.

LOFTIN, R. W. 1984. Ospreys hail long-time friend. Fla. Natur. 57(3): 7.—Sam Grimes, honorary member of FOS, received honorary Doctorate of Science degree from Univ. North Florida, 5 May 1984.

MAEHR, D. S. 1984. Status of birds using phosphate-mined lands in Florida. Amer. Birds 38: 28-31.—In northern and central Florida.

MAHONEY, S. A. 1981. Some aspects of the thermal physiology of Anhingas, *Anhinga anhinga* and Double-crested Cormorants, *Phalacrocorax auritus.* Pp. 461-470 *in* Proceedings of the Symposium on birds of the sea and shore, African Seabird Group. (J. Cooper ed.).—Laboratory studies on birds from Florida.

MAHONEY, S. A. 1984. Plumage wettability of aquatic birds. Auk 101: 181-185. —Of 9 species tested, Double-crested Cormorant, Anhinga, and Brown Pelican from Florida.

MCDONALD, M. V. 1984. Breeding bird census. No. 170. Gulf coast salt marsh. Amer. Birds 38: 119.—Levy Co., Cedar Key-6 km NNW.

MCNAIR, D. B. 1984. Clutch-size and nest placement in the Brown-headed Nuthatch. Wilson Bull. 96: 296-301.—Includes Florida records.

MINICHIELLO, J. K. 1984. Bon appetit! Living Bird Quarterly 3(3): 25.— Excellent photo of *Buteo lineatus extimus* at Sanibel, Lee Co. Photographer watched bird land on water, float for a minute, row to shore and hop onto the bank clutching a large rat (probably *Orzyomys palustris*).

Nesmith, C., and J. Cox. 1984. Winter bird-population study. No. 109. Longleaf pine forest. Amer. Birds 38: 63.—Leon Co., Tallahassee-5 mi. SW.

Nisbet, I. C. T. 1984. Migration and winter quarters of North American Roseate Terns as shown by banding recoveries. J. Field Ornithol. 55: 1-17.—Includes recovery at Pompano Beach 2 months after banding in Massachusetts.

Reichel, W. L., et al. 1984. Pesticide, PCB, and lead residues and necropsy data for Bald Eagles from 32 states—1978-81. Environ. Monit. Assess. 4: 395-403.—Of 293 birds, over half died from trauma, shooting, or electrocution. Eagles from Florida (10% of total) more likely to have died from trauma than eagles from other states. Of 15 from Florida that died from trauma, 7 hit by a vehicle.

Schreiber, R. W., and E. A. Schreiber. 1983. Use of age-classes in monitoring population stability of Brown Pelicans. J. Wildl. Manage. 47:105-111.—As studied on Florida's Gulf coast, Tampa Bay-Naples.

Shields, L. J., and B. S. Mueller. 1982. A radio transmitter for quail (abstract). Proc. Natl Bobwhite Quail Symp. 2: 93.—As perfected at Tall Timbers Res. Sta., Leon Co.

Smith, G. F., et al. 1982. A 10--year study of Bobwhite Quail movement patterns. Proc. Natl. Bobwhite Quail Symp. 2: 35-44.—In Florida.

Sykes, P. W. 1984. The range of the Snail Kite and its history in Florida. Bull Fla. State Mus., Biol. Ser. 29: 211-264.

Sykes, P. W., Jr. 1984. North Carolina, South Carolina, Georgia, Florida. Amer. Birds 38: 411-414.—Summaries of 84 Audubon CBC.

Snyder, N. F., et al. 1984. Larval dermestid beetles feeding on nestling Snail Kites, Wood Storks, and Great Blue Herons. Condor 86: 170-174.—Kites and storks in Florida and herons in Ohio.

Stedman, S. J. 1983. Florida-marked Turkey Vulture sighted in east Tennessee. Migrant 54: 56-57.—A bird with green patagial tag marked in Dade Co., sometime between Dec. 1977 and May 1980, sighted on 11 April 1981.

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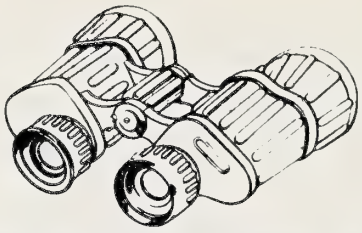

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Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 13, NO. 2 MAY 1985 PAGES 25-48

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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All members receive the Florida Field Naturalist and the Newsletter. Subscription price for institutions and non-members is $10 per year. Back issues ($3.00 per issue) are available, prepaid, from the Treasurer. Notice of change of address, claims for undelivered or defective copies of this journal, and requests for information about advertising and subscriptions should be sent to the Treasurer.

The Florida Field Naturalist is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 13, NO. 3 AUGUST 1985 PAGES 49-76

SOME BREEDING SEASON VOCALIZATIONS OF AMERICAN CROWS IN FLORIDA

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Abstract.—In a 5-year study on a Florida ranch, the tameness of American Crows facilitated study of vocalizations made in the early breeding season. Among soft vocalizations heard were *Cu-koos*, *Kuck-woo-oos*, intimate notes made when a pair was on the nest and, rarely, Barred Owl-like calls. *G-wal-op, g-wal-ops* were loud vocalizations audible at considerable distances. Like them in being given as doublets were a variety of other vocalizations, such as *G-wong, g-wong* and *Kwarr-uck, kwarr-uck* that were given more as individual peculiarities. Also described are bowing displays that were, at times, accompanied by moans and bill-clacks.

In addition to their usual cawing, American Crows (*Corvus brachyrhynchos*) have other vocalizations, many associated with the breeding season, that may sound "uncrowlike" to a human listener. Some of these are so softly uttered that one has to be within 10-15 m to hear them. Others, while loud and far-carrying, still require that one be near by to discover in what context they are being made. As here reported, my wife and I watched crows in a locality where they were tame and allowed us close approach. The only previous study of some of these special vocalizations known to me is that of Chamberlain and Cornwell (1971). At that date little or no information was available on such features of crow behavior as territoriality (Kilham in press), cooperative breeding (Kilham 1984a), early breeding season behavior, including courtship and dominance (Kilham 1985) and copulation (Kilham 1984b) that might have aided in understanding contexts. Although Chamberlain and Cornwell report three of the vocalizations that I describe, i.e. the *Cu-koo* and the *G-wal-op, g-wal-ops* (*C. b. pascuus* screams), and the rattling cry, they do so in only a few lines. A further difficulty in their otherwise notable paper is failure to define how they differentiated adults from yearlings.

Florida Field Naturalist 13: 49-57.

Study Area and Methods

My wife and I watched 2-4 groups of cooperatively breeding crows from January to April, 1981-1985 at the Hendrie ranch, 24 km south of Lake Placid, Florida. Each group consisted of a breeding pair plus 2-5 auxiliaries. The crows were tame owing to years of protection and feeding of corn. Although unmarked by banding, the members of breeding pairs could be identified by the dominance of males, the fact that females did all of the incubating, as noted by Good (1952), and other criteria discussed in previous publications (Kilham 1984b, 1985). Yearlings were identified by Emlen's (1936) criteria, of which the square outline of the tail and the frayed tips of the rectrices were most helpful. I used a Sony WM D6 "Professional Walkman" recorder with a Realistic, 33-1062, Ultra-Directional Electret microphone. Copies of my recordings (available to other workers) have been deposited in the Florida State Museum Bioacoustic Archives, Gainesville, Florida.

Observations

Bowing displays.—A crow began these displays with a few shakes of its head, accompanied by mammalian-like moans, then pulled its head in against its breast to bow its head to its toes, while opening and clacking its bill. The same sounds might be accompanied, at times, by only a deep nodding of the head, or the bowings might be made in silence.

G-wal-op, g-wal-ops.—These calls (Fig. 1A), delivered as a doublet and loud enough to carry throughout a territory, were seldom given near a nest unless softly and singly at times of copulations, or once, repeatedly, when a recently completed nest was visited by a Red-tailed Hawk (*Buteo jamaicensis*). Full *G-wal-ops* appeared to be given mainly by the dominant or breeding male. One male came to a tall stub above where we got out of our car in two successive years to deliver repeated *G-wal-op, g-wal-ops* accompanied by bowings, the back of his neck appearing humped due to a raising of feathers. This was for a limited time of about 10 days at the start of nesting. Some yearlings, in early breeding seasons, gave hundreds of *Gwal-ops* of low volume, as if practicing.

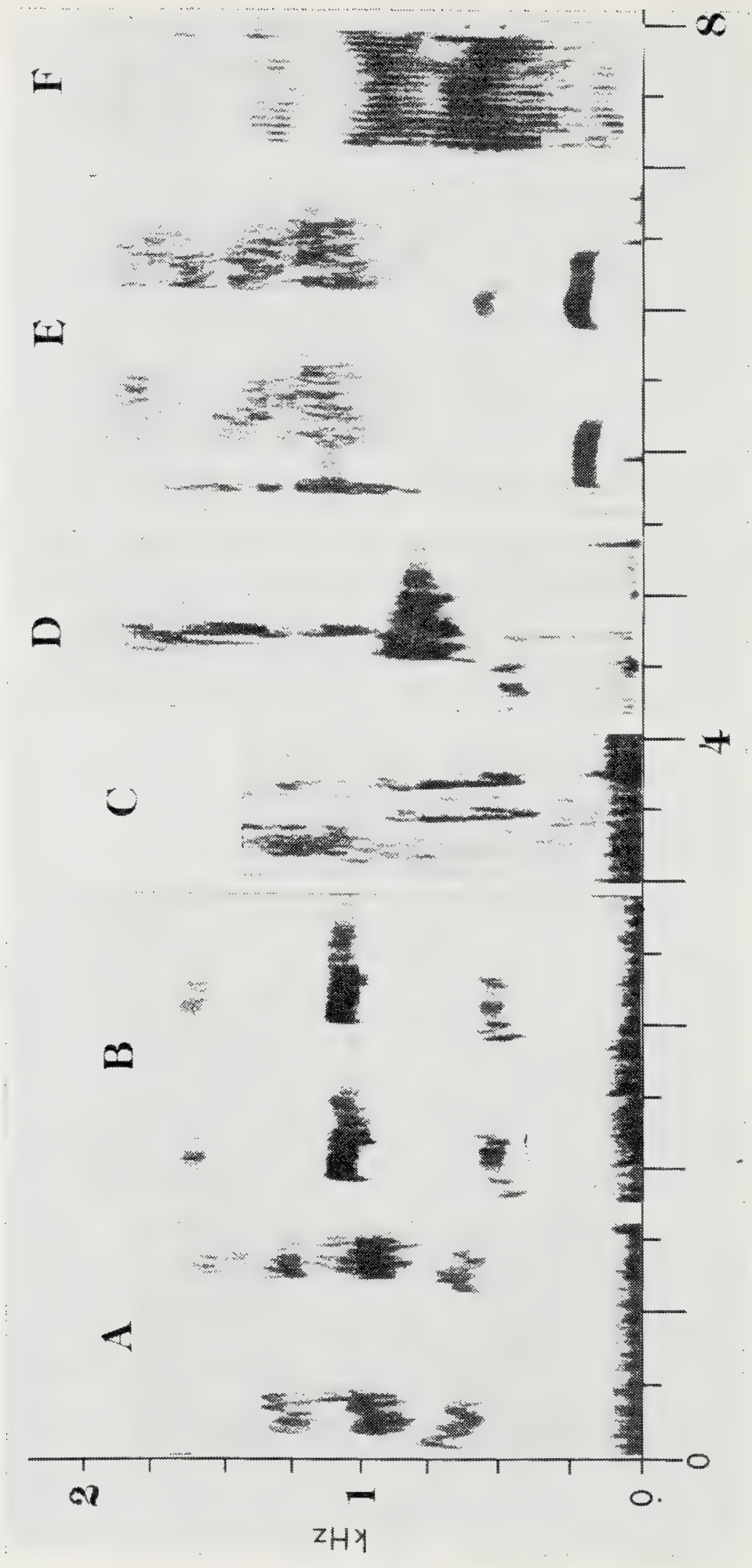
Other loud vocalizations.—A confusing situation was that *G-wal-ops* were one of a series of vocalizations related in being loud and given as doublets. Among the commoner of these were *G-wong, g-wongs* (Fig. 1B); *Kwar-uck, kwar-ucks* (Fig. 1G); *Guelph, guelphs* (not illustrated) and *Kuk, kuks* (Fig. 1H). Some yearlings gave one or more of the variants repeatedly as did some older auxiliaries. These latter were almost always ones driven away from

the rest of a group by the breeding male and apt to be by themselves. One breeding female gave *G-wong, g-wongs* in two successive years, often when perched next to her mate.

Cu-koos.—*Cu-koos* (Fig. 1C) were nearly always given singly. They might be given at the end of a deep bow or by themselves with only a slight bow from a branch or out in a pasture. *Cu-koos*, counted in 1983, were given when the two of a pair were together (n = 45), or nearly as frequently (n = 43) when a crow was alone. Single *Cu-koos* were the most frequent of vocalizations given before copulations (Kilham 1984b). Crows appeared at times to use *Cu-koos* as a greeting. A yearling walking below an oak on 1 March, gave a *Cu-koo* when the breeding female flew from her nest above. In another episode a female incubating on her nest gave a *Cu-koo* when her mate came to a perch 7 m away. I heard *Cu-koos* occasionally (n = 26) when the two of a pair were together on or by a nest prior to egg-laying. On three occasions a female incubating on a nest gave a soft *Cu-koo* immediately after a crow in the distance gave a *G-wal-ops*. Some females (n = 3) gave a *Cu-koo* when returning to a nest during incubation, either on landing or on the wing. In 1985 two breeding males were alike in giving a *Cu-koo* with bowing display when landing among others of their group feeding on corn, possibly as an expression of dominance.

A feature unique to *Cu-koos*, noted in all 5 years, was the way a crow might, seemingly, address them to my wife or me directly, flying to a perch 4-5 m overhead to do so. When a breeding male, one of the tamest of the crows, did this on 20 February, he bowed and gave bill clacks. Not all incidents were near nests. I was walking across a pasture on 15 January, with no crows in sight, when I heard a *Cu-koo*. When I turned, a crow that had alighted 6 m behind me gave *Cu-koos* five more times. Much the same events happened on another morning when I turned to find five crows that had apparently followed me. They were thickly bunched and making motions as if feeding on corn although none was there. It was striking on three of these occasions when crows seemed to be soliciting corn that *Cu-koos* were the only vocalization given.

Kuck-woo-ooos.—These vocalizations (Fig. 1D) were like *Cu-koos* in being associated, at times, with bowing displays and in having an exotic quality, like the cooing of some tropical dove. The two calls, however, were distinct. *Kuck-woos* differed from other vocalizations in having a faraway quality. When sitting by a nest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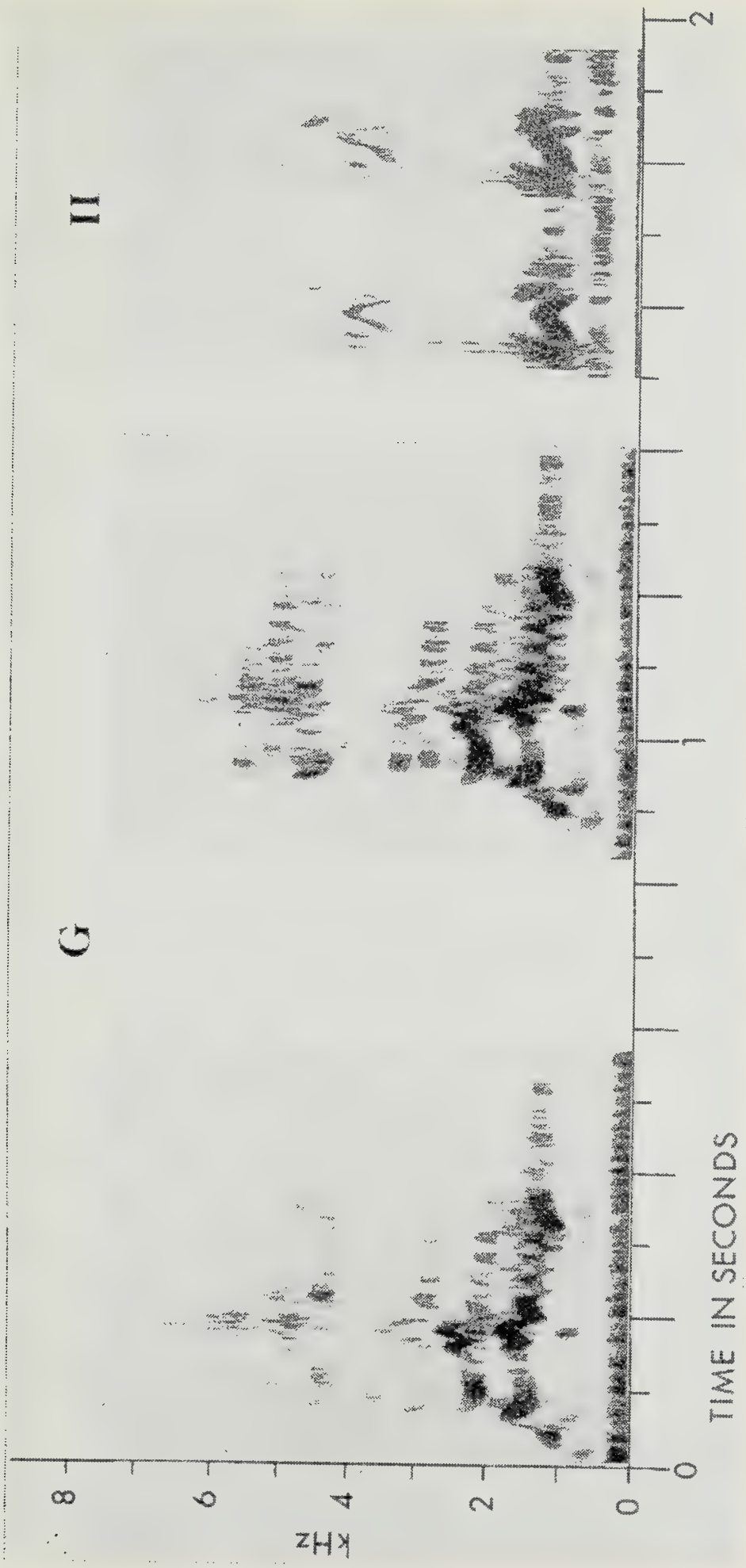

Figure 1. Special vocalizations of American Crows in Florida: A, *G-wal-op, g-wal-op*; B, *G-wong, g-wong*; C, *Cu-koo*; D, *Kuck-woo*; E, Play Vocalizations of Yearling; F, Rattling Cry; G, *Kwarr-uck, kwarr-uck*; H, *Kuk, kuk*. Note Different frequency and Temporal Scales Above and Below.

being built on 2 February, I heard what I thought to be a distant *Kuck-woo-ooo*. Then I wondered if it came from the top of an oak next to me. It took a minute to discover that the performer was on a branch 5 m away. The bird bowed twelve times as it lowered its head. Its wings were not moved and its tail was only slightly fanned. An indication that a *Kuck-woo* may serve as a low warning, at times, was suggested on 3 mornings when, otherwise silent, a breeding male gave *Kuck-woos* when driving away a gray squirrel (*Sciurus carolinensis*). A yearling that aided him on 2 mornings remained silent. The most continuous performances I heard were when a crow, perched on a cabbage palm (*Sabal palmetto*), gave *Kuck-woos* at a rate of 12/min for 5 min. A single interruption was a *Who-who-who-ah* like the hooting of a Barred Owl (*Strix varia*).

Barred owl calls.—I first heard these calls (not recorded) on 3 March 1952 when, close to a pair of crows in Seneca, Maryland, I heard one of them give *Who-Whos* in the course of singing. I did not hear the calls again until my wife and I heard them in Florida (n = 5). They are the only calls that I have heard made by crows, whether hand-raised (n = 4) or wild, that sounded mimetic.

Singing.—It is impossible to classify the mixtures of *Cohs, Caas, Cu-koos, G-wal-ops,* and *Kuck-woos,* mingled with groans, moans and, at times, varying *Caws* given at rates of up to 60/min. The effect is that a crow, often in solitude, is going over its entire repertoire of sounds. Most performers that I have been able to identify have been yearlings (Fig. 1E). Some older auxiliaries, ones that have become somewhat isolated by being driven away repeatedly by a dominant male early in the breeding season (Kilham 1985), may become the most vocal of crows with whom they are associated.

Rattling.—I heard rattles (Fig. 1F) a few times, always briefly, in conflicts between crows and both Red-shouldered (*Buteo lineatus*) and Red-tailed hawks. A lone crow that kept trying to join other groups in 1984-1985 made repeated rattles when being driven away.

Intimate notes.—A variety of soft sounds (not recorded) that might include moans and growly notes were made, at times, when members of a pair were together, as on nests in weeks prior to incubation, or again at the end of nesting in what appeared to be renewed courtship. This close vocal contact, or "talking," is described by Lamm (1958) for the Pied Crow (*C. albus*).

Discussion

American Crows are sexually monomorphic and lack specialized feathers or colors that might aid in displays. Calls associated with contortions of the head and neck are characteristic of a number of corvids. Amadon (1944) described the piston-like thrusts that accompany the hiccup of the Florida Scrub Jay (*Aphelocoma c. coerulescens*) and Goodwin (1976), the odd postures assumed by European Jays (*Garrulus glandularus*). In these latter the back of the neck is humped as the head is bent downward. American and Carrion (*C corone*) (Wittenberg 1968) Crows have a similar silhouette when producing their calls which, like those of the European Jay, terminate in an upward jerk of the head. Singing or soliloquies are described by Goodwin (1976) for the Rook (*C. frugilegus*), by Lorenz (1970) for the Jackdaw (*C. monedula*) and by Baeyens (1979) for the Black-billed Magpie (*Pica pica*), Baeyens noting that the observer must be close to hear them. It would be of interest to know whether the singing in these varied species is done by adults or primarily by yearlings, as I have noted for American Crows.

Some of the vocalizations that I have described may sound different to others. Chamberlain and Cornwell (1971) describe *G-wal-ops* as being intense, raucous screams, whereas Stoddard (1978) described an American Crow, repeatedly bowing below the horizontal, as "uttering a note I had never heard before, which sounded very strange and carried a quarter mile away—a *t-o-o-t-o-o-w-a-h.*" It may be that *G-wal-ops* are restricted to *C. b. pascuus* for, were they given by northern crows, I feel sure that I would have heard them in Maryland or New Hampshire. Townsend (1927) heard *Cu-koos* in Massachusetts.

Bill-clacking similar to what I noted in displays of American Crows, is reported by Bacchus (1943) for Carrion Crows and by Gwinner (1964) for the Common Raven (*C. corax*). Bent (1946, p. 276) refers to a "curious clattering of the bill—which resembled horny plates struck together" in the Northwestern Crow (*C. caurinus*).

In seeking a meaning of some of the "uncrowlike" vocalizations of American Crows I have never been able to note any response of one crow to another giving a *Cu-koo*, a *Kuck-woo*, or *G-wal-op*, *g-wal-ops*. If these vocalizations have precise meanings, it may take

years to determine what they are. But I have an impression that American Crows are highly individualistic and express their individuality in a wide range of vocal peculiarities. One yearling gave repeated *Cu-koos* whenever I passed in its vicinity, which was daily throughout the nesting period; a female gave *G-wong, g-wongs* when with her mate; another *Kuk-kuks* for several years when no other member of its group was giving them, and a lone crow that belonged to no group, gave, at times, seemingly endless rattling cries. Although vocal peculiarities are most marked in yearlings, they may persist in some individuals from year to year.

Since the above was written, Brown (1985). has published a study of song and vocal imitation of American Crows, a study made largely of hand-raised crows maintained in cages. Since my studies were made under natural conditions, of crows participating in the nesting and other activities of cooperative groups, made up of a breeding pair plus auxiliaries of various ages, it is not surprising that our findings differ.

Acknowledgments

I thank James H. Hendrie, Sr. and John D. Hendrie for their kindness in permitting my wife and I to visit their ranch; James N. Layne and Fred E. Lohrer of the Archbold Biological Station, Lake Placid, Florida, for general assistance and J. W. Hardy of The Florida State Museum for advice on making recordings and providing sonograms.

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REVIEW

An index to Georgia bird records in American Birds (Volumes 25-37, 1971-1983) and its predecessor, Audubon Field Notes (Volumes 1-24, 1947-1970).—Robert W. Loftin. 1984. Occasional Publ. No. 9, Georgia Ornithological Society, 28 pp., $4.00 by mail from G. O. S., 869 Clifton Road, N.E., Atlanta, Georgia 30307.—Complete compilation of Georgia records from the Seasonal Reports, articles, and Changing Seasons. Arranged by species and catagories such as "sparrows" and "blackbirds," The index includes 376 species and four hybrids. This extensive contribution is a suitable companion to Florida's Index, F.O.S. Special Publication No. 1.—**James A. Kushlan**, Department of Biological Sciences, East Texas State University, Commerce, Texas 75428.

DEFENSE AS A FACTOR IN BILL-TUCKING

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Abstract.—Bill-tucking, the insertion of a bird's bill beneath the back feathers, was investigated in shorebird flocks in Florida. The birds tended to tuck their bills outward and toward the side of greatest potential disturbance. The findings suggest that one function of bill-tucking is defense.

Bill-tucking, the insertion of the bill under the scapular feathers, is a posture often associated with a resting or sleeping bird (Lendrem 1983, Ball et al. 1984, Amlaner and McFarland 1981). Halkin (1983) observed that birds in a flock tended to tuck to the side nearest the periphery, possibly as a defensive measure. In this note I analyze bill-tucking behavior in three flocks of resting birds.

Bill-tucking may have several functions. It decreases muscular work (Worden 1956: 7) and may conserve heat as well. Deighton and Hutchinson (1940) attributed a 12% decline in metabolic rate for cockerels in bill-tucked posture to lowered heat loss or deeper sleep. Bill-tucking has also been described in non-resting situations where it has been interpreted as a "displacement activity" (citations in Edwards et al. 1948, Cornwell and Bartonex 1963). Defense from predators may also be a factor in the way birds tuck their bills (Halkin 1983). If this be so, a bird in a flock should tuck its bill toward the outside of the group. In addition, just as a wagon train in a circle will fortify itself most heavily in the direction of expected attack, a flock with a high probability of disturbance from one direction should show a greater proportion of individuals tucking toward that side.

METHODS

I defined a flock as an aggregate of resting birds, the long-body axes of which were mostly oriented in the same direction. The flock was arbitrarily divided into four sections (Fig. 1): Front, Rear, Middle-Left (ML), and Middle-Right (MR). Spotting scopes (20x and 30x) and a pair of 7 x 35 binoculars were used for all observations. The tucking (or non-tucking) posture of each bird and its position in the flock were recorded by a second observer as I called them out. It was possible that an occasional bird was recorded twice or not at all because of movements within the flock during observations. The data from tucking Middle birds were analyzed using Chi-square (2 x 2) tests and binomial tests (Siegel 1956).

Florida Field Naturalist 13: 58-63.

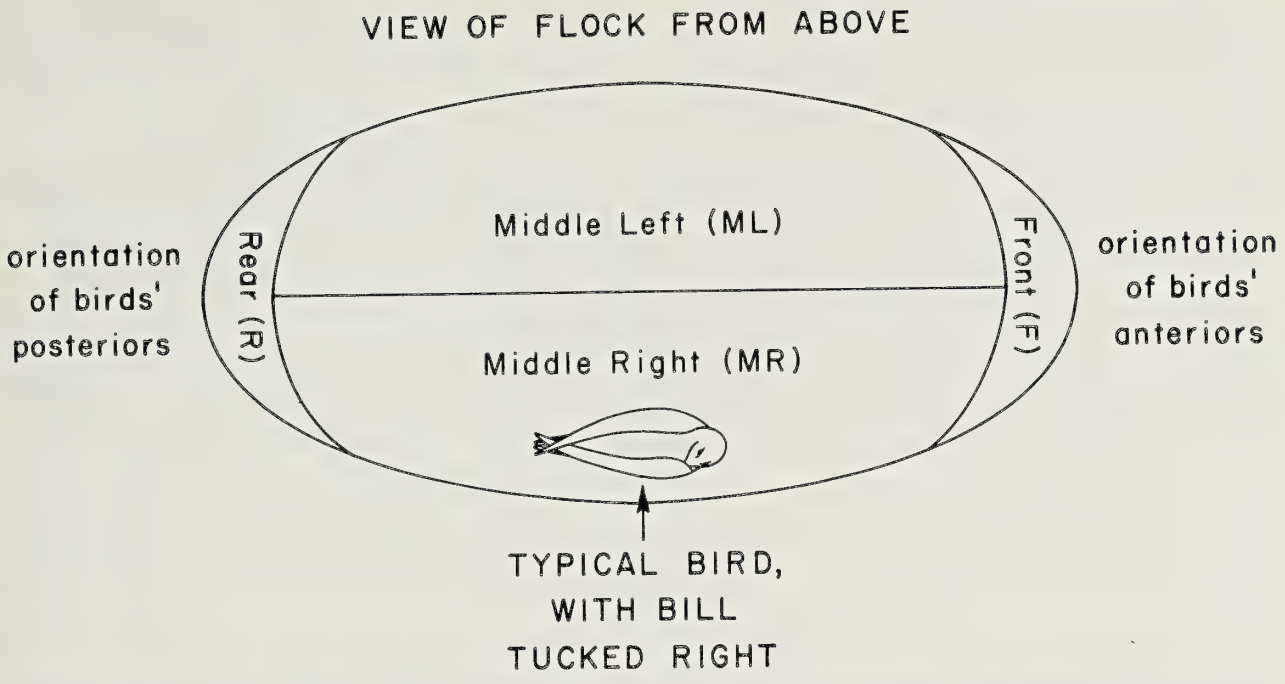

Figure 1. Schematic view of a flock from above showing arbitrary divisions into Front, Back, Middle-Left (ML) and Middle-Right (MR). The latter two divisions were surveyed to see on which sides the birds tucked their bills while at rest.

Results and Discussion

Flock 1 was observed on 15 March 1984 at St. George Island, Franklin Co., Florida, at 1630 EST. Approximately 90% of the birds were Ring-billed Gulls (*Larus delawarensis*) ; Laughing Gulls (*L. atricilla*) and Herring Gulls (*L. argentatus*) composed the remainder. The group was oriented into a light westerly breeze on a sandy beach with water to its left and a small sand dune to the right. From a position on the sand dune near the front of the flock I recorded the position and bill-tucking posture of about 70% of the birds. Flock 2 consisted primarily of Willets (*Catoptrophorus semipalmatus*), with a few scattered Whimbrels (*Numenius phaeopus*) and one Great Blue Heron (*Ardea herodias*). The flock was in a marsh south of Lighthouse Road in St. Marks National Wildlife Refuge, Wakulla Co., Florida, on 16 March 1984 at 1330 EST. The tightly-grouped oval flock oriented into a light southerly breeze under warm and sunny skies. I collected data from an observation tower to the right of the flock. One bird was excluded from analysis because its body was oriented opposite to the rest of the group. I observed a predominantly Black Skimmer (*Rynchops niger*) flock (Flock 3) from the left across a narrow boat channel on a concrete dock at the Gulf Coast Ranger Station at Everglades City, Collier

Co., Florida, on 25 March 1984 at 1545 EST. A lumber pile was to the right and buildings and docking area were to the rear of the flock. A tour boat passed through the channel very close to the flock before and during the observation period but the birds did not noticeably alter their behavior. The group was oriented toward the water, slightly to the left of a 15 km/h southwesterly wind (measured with a Dwyer wind meter). The front of the group was more dispersed than the rear and was composed mainly of Ring-billed Gulls and Laughing Gulls, although these birds made up less than 5% of the total flock. Several birds were lying prone; one prone skimmer was tucking at the time of notation.

I found no relationship between position in the group and tucking direction ($df = 1$, $\chi^2 = 0.06$, $P > 0.80$) for Flock 1 (Table 1). A Chi-square test indicated that the Willets in Flock 2 exhibited a strong tendency to tuck their bills to the outside of the flock ($df = 1$, $\chi^2 = 11.90$, $P < 0.001$). A two-tailed binomial test (Siegel 1956) revealed no overall preference to tuck to a particular side ($z = -1.53$, $p = 0.13$). In Flock 3 I also found a significant outward bias in bill-tucking ($df = 1$, $\chi^2 = 4.55$, $P < 0.05$) although this was due mainly to the ML birds (65% tucked left) ; the MR birds were evenly divided in tucking direction. Although binomial analysis disclosed no overall tucking preference ($z = -1.81$, $p = 0.07$), the results remain suggestive of a left-side bias.

There was obviously greater disruption from the left in the skimmer flock I observed (Flock 3). The birds may have been responding as indicated by the greater proportion of left-tucking birds in the MR than would be expected for a flock with an even distribution of disturbance around it. The Willets (Flock 2) were in a fairly uniform environment, being located in the middle of a quiet marsh with a good view all around. No direction seemed to me to be more "dangerous" than any other. The birds tucked outward but did not show an overall flock preference for one side (the p-value is, however, small enough to be suggestive). The gulls (Flock 1) may have exhibited random tucking because of the smaller percentage of conspecifics or because the flock was more scattered and active than were the other two flocks.

Halkin's (1983) bill-tucking observations on Black Skimmers were made in the same location as mine and demonstrated the same general orientation. Sampling the left side of the flock, she found the birds tucked significantly more to the left. Halkin also "disturbed" the flock from the right, compared before and after results

Table 1. Number of birds tucking bill left or right in relation to position in flock.

Direction of Bill-tuck	Ring-billed Gull Flock 1			Willet Flock 2			Black Skimmer Flock 3		
	ML[1]	MR[2]	Total	ML	MR	Total	ML	MR	Total
Left	8	14	22	45	26	71	59	49	108
Right	8	12	20	17	36	53	32	50	82

[1]ML = Middle-Left portion of flock.
[2]MR = Middle-Right portion of flock.

from a small proportion of the flock and found that more birds tucked to the side of the disturbance, although this difference was not statistically significant.

Many studies have investigated the relationships between flocking and predator defense. Pulliam (1973) presented a mathematical model showing that the probability of detecting a predator increases with flock size. Barnard (1980) found, as did Bertram (1980), that individuals became less vigilant (scanned less) with increasing flock size and that the flock as a whole was unable to spot predators any sooner in a large group than a small one. Mallard (*Anas platyrhynchos*) vigilance ("peeking" rate) is not much affected by flock size per se, although it decreases with increasing number of conspecifics between the focal bird and the most exposed side of the group (Lendrem 1983). Metcalfe (1984a) discovered that shorebirds share vigilance with both conspecifics and other species of similar size as long as they are within sight. Lendrem believed that an individual's vigilance decreases with a greater number of more-vigilant companions. Male Mallards in conspicuous nuptial plumage had higher peeking rates than either females or males in eclipse coloration. Female peeking rates declined as the proportion of nuptial males increased but were unaffected by eclipse males. Ostriches (*Struthio camelus*) showed increased vigilance in the presence of conspecifics (Bertram 1980).

Several authors have noted increased vigilance in higher-risk situations (Underwood 1982, Metcalfe 1984b, Barnard 1980, Amlaner and McFarland 1981). Underwood (1982) and Inglis and Lazarus (1981) have shown further that animals on the periph-

ery of a group are more vigilant than those in the center. Finally, Ball et al. (1984), Lendrem (1983) and Amlaner and McFarland (1981) have described vigilance in tucking birds. When tucked Herring Gulls are disturbed they often maintain their tucking posture, perhaps in a wait-and-see attitude (Amlaner and McFarland 1981). But although tucked gulls allowed an investigator nearer than did resting birds before changing posture, they took flight at the same time (Ball et al. 1984).

Many opposing and interrelated factors in addition to defense probably influence bill-tucking behavior. These factors undoubtedly differ among species in type and importance. My findings suggest that, among some Charadriiformes at least, one important function of bill-tucking is defense. I interpret my results to suggest that birds in a flock tend to tuck their bills outward, and that the flock as a whole will tuck more to the side of greatest possible disruption.

Acknowledgments

I am very grateful to Jack P. Hailman for his critique of this manuscript. His intensive Field Ethology course at the University of Wisconsin made this study possible. All members of the course were involved at one time or another; I am especially appreciative of Norman Thomson's suggestions and A. Margaret Elowson's advice on data collection. Elowson and Cary Hunkel kindly transcribed the data. Sylvia L. Halkin has been an invaluable critic, reviewer and source of ideas.

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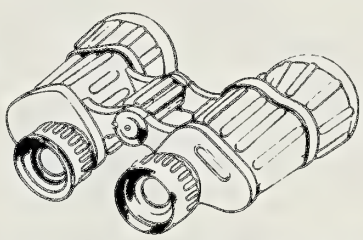

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NOTES

A recent record of the Bachman's Warbler in Florida.—From 0815 to 0930 on the morning of 30 March 1977, west of Melbourne, Brevard County, Florida, I observed and photographed a Bachman's Warbler (*Vermivora bachmanii*) foraging in a sparsely leafed willow (*Salix sp.*) and a Brazilian pepper-tree (*Schinus terebinthifolius*) next to a dike road (Fig. 1). The area was an extensively ditched part of the St. John's River flood plain. In the drier portions Brazilian pepper-tree predominated, whereas in the wetter areas extensive willow thickets were scattered within a large grassy savannah.

I was unable to identify the warbler in the field. The very plain-looking warbler had a faintly yellowish forehead, lores, and a diffuse yellowish eye-ring. The crown and hind-neck was gray; the upper back was olive; and the wings and tail were a darker olive-gray. The notched tail did not have noticeable tail-spot, and the wings showed no wing-bars. The throat appeared gray-white, shading to faintly yellow on the breast and gradually merging again to gray-white on the lower abdomen and under-tail coverts. The breast had slightly brighter yellow areas on both sides of the paler mid-line, which gradually merged with grayish on the breast in front of the wings. The upper mandible was dark and slightly decurved, the lower mandible was pale flesh at the base and slightly darker toward the tip. The tarsus and toes were brown-flesh. During my lengthy observation of this warbler, I had directly compared it with Orange-crowned Warbler (*Vermivora celata*), which was noticeably larger and more robust, Common Yellowthroat (*Geothlypis trichas*), which was similar in size, Northern Parula (*Parula americana*), which appeared slightly smaller, and Palm Warbler (*Dendroica palmarum*), which was much larger.

Later the same morning I notified Johnnie Johnson and Dan Heathcote of the location of this warbler. They also had an opportunity to study it but likewise could not offer an identification, nor could other local observers who later examined the photographs.

I had no idea what this warbler could be until approximately a year later. While leafing through Bond (1971), I found a brief description of the immature female Bachman's Warbler that matched the plumage of my warbler very closely. Having already eliminated all other species with which I was familiar, I began reading about the Bachman's Warbler and became convinced that this was the species I had seen.

In 1980, I read of a sighting of the female Bachman's Warbler in Cuba (Ripley and Moreno 1980). Consequently, I sent my photos to Mr. Ripley for his evaluation. I received a reply from Roger F. Pasquier of the National Museum of Natural History stating that he and Mr. Ripley had examined my photos and both had a strong impression that my bird was indeed Bachman's Warbler. However, it was not possible to absolutely rule out the possibility that it was a pale female Orange-crowned Warbler because in one overexposed photo it appeared gray and white. They also stated, in part ". . . The features that match Bachman's Warbler particularly closely are the curvature of the upper mandible, the eye-ring, and the irregular distribution of yellow on the forehead, lores, and otherwise whitish breast. The notched tail, typical *Vermivora* bill, and other features preclude it being a drab female Common Yellowthroat. The light rump eliminates Nashville

Figure 1. Immature female Bachman's Warbler at Melbourne, Brevard Co., Florida, 30 March 1977.

Warbler (*Vermivora ruficapilla*) in any plumage. The specimens your bird most closely resembles are Bachman's Warblers USNM 454258, a female collected at Guantanamo, Cuba, on 5 December 1912, and USNM 263254, a female collected at Bay St. Louis, Mississippi on 26 March 1902. The latter bird is labelled (sic) "immature"; I don't know whether this means anything biologically, since we have no information on whether palish, presumably first year, birds do not breed or in any other way not behave as adults. It does indicate, however that even in March some females resemble the bird in your photograph in that they have very little yellow on the undersurface . . ."

I replied that in direct comparison, the Orange-crowned Warbler was noticeably larger, and most importantly, its legs and bill were very dark. The Bachman's Warbler had very pallid legs and lower mandible.

Although it did appear that I had photographed a Bachman's Warbler, I wanted to satisfy myself that the bill on my bird was correct for that species. The bill on Bachman's is very distinctive, long and slightly decurved. My photos showed the curvature of the upper mandible well but none showed a perfect profile. In 1982 Dan Heathcote and I visited The Academy of Natural Sciences in Philadelphia to examine specimens of Bachman's Warblers and of any other species with which it could be confused. We found considerable variation in plumage of both sexes of Bachman's Warbler and also in bill length and depth at the base of the bill. One male specimen (Phila. 41449) had a bill matching that of the bird in my photos. We also examined many specimens of all species that remotely resembled a female Bachman's Warbler. No other specimens resembled the bird I photographed.

One diagnostic point we noted on the female Bachman's specimens and on my photos was the grayish area in front of the wings, which is actually an extension of the gray neck onto the sides of the breast. This plumage is mentioned by Hamel et al. (1982) and is well shown in his accompanying plates.

In February 1984 Henry M. Stevenson wrote me asking to have a set of my photos deposited at Tall Timbers Research Station, Tallahassee, Florida. I complied and received a reply stating in part, ". . . Barring the unlikely chance of some exotic species unfamiliar to me that somehow got to Florida, I fully concur that you saw Bachman's Warbler. The clincher for me was the pose just beside a rather large limb with the bird facing you but with its

head turned slightly to one side. Although I probably never saw one in this plumage (i.e. imm. female) I have seen enough females that come close to this appearance . . ." Stevenson has had considerable field experience with Bachman's Warbler in Alabama between 1936 and 1939.

Ned Johnson and Stephen F. Bailey examined the photos and both agreed that Virginia's Warbler (*Vermivora virginniae*) or Nashville was definitely not involved and Bailey stated that Bachman's could be a possibility.

Alternative species had been eliminated and the preponderance of evidence indicated that this was a Bachman's Warbler. The date of this sighting corresponded to the very early spring migration of the species. My seven years of research found nothing but positive evidence. Stevenson cataloged the photographs at Tall Timbers Research Station as Bachman's Warbler, TTRS numbers 377-381, and this sighting was accepted by the Florida Ornithological Society Records Committee.

Historically, the Bachman's Warbler passed through Florida as a migrant in spring along the Gulf coast, as summarized by Stevenson (1972). In Brevard County only three previous records (4 birds) have been noted by Cruickshank (1980), all between 1889 and 1905. In the past decade (1975-85), Bachman's Warblers have also been reported from four locations: Long County, Georgia, in August 1975 (Johnson and Landers 1982), probably a fall migrant, and in spring from the Louisiana coast (B. Newman in Imhoff, 1977); I'On Swamp, South Carolina (Shuler et al. 1978); and the previously mentioned female from Cuba as late as 1980.

Acknowledgments

I am grateful for many helpful comments on the identification from S. F. Bailey, R. L. Crawford, S. Gauthreaux, F. Gill, P. Hamel, N. Johnson, R. F. Pasquier, S. D. Ripley, and H. M. Stevenson. F. Gill, and M. Robbins for assistance and access to collection at The Academy of Natural Sciences. H. P. Langridge and H. M. Stevenson made helpful suggestions on early drafts of this manuscript.

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Nest attentiveness by Florida Sandhill Cranes.—Few observations have been made of nest attentiveness of Sandhill Cranes primarily because nests are difficult to observe without disturbance. In February-March 1984 I had an opportunity to observe a roadside nest of Florida Sandhill Cranes (*Grus canadensis pratensis*). The nest was 8 km west of Lake Hatchineha, Polk County, Florida (Sec. 20, T28S, R28E), amongst vegetation in a roadside pond. The vegetation was predominantly arrowhead (*Sagittaria lancifolia*) with several low buttonbushes (*Cephalanthus occidentalis*) protruding above the arrowhead while a lone 10 m leafless tree draped with Spanish moss stood about 20 m to the west. The arrowhead patch was about 20 m wide and 30 m long. The remainder of the pond was chiefly maiden cane (*Panicum hemitomum*), the water appearing to be up to 30-40 cm deep.

I first observed the nest, with A. G. Dowding, on 23 February 1984. On 2 March Miles Pealle and I watched the nest all day. It was observed again on 13, 19 and 22 March at which time the adults were accompanying and feeding two newly hatched chicks.

On 2 March 1984 I watched the pair from 0615 until 1310; M. Pealle watched them from 1310 until 1410 when I continued until dark at 1835. The watch was made from our cars along the roadside. The highway was rather busy. Between 0800 and 1830, 616 vehicles went by of which 48 were heavy trucks and 120 smaller trucks. The cranes paid no attention to the traffic nor to our cars about 200 m from the nest. The sky was clear except for a few cumulus clouds. At break of day the temperature was 0°C with a light frost whereas the high that day was 18°C at Lake Wales.

The larger bird, apparently the male, roosted only a few meters from the nest while the female incubated the eggs. At 0715 the pair silently changed places at the nest. She walked away into the pond feeding. At 0842 the male stood up, worked with the nest and eggs, stepped into the water and began pulling vegetation throwing it back with a sidewise motion toward the nest. Much of it landed in the water beside the nest. He continued this until 0847, then he hurried back to the eggs at 0848. At 1034 the female waded from the west in the direction of the nest. The male stood up. He instigated a "Unison Call". The birds gave it three times, male with head up, secondaries slightly raised; the female with wings tight against her sides. The female then sat down on the eggs. At 1040 the male was 18 m from the nest still throwing vegetation in its direction. He then walked 45 m away, then flew, circling the pond but landed in an open spot 90 m from the nest in taller vegetation. At 1135 she worked with the nest and eggs while at 1244 the male flew in from the south. He landed 20 m from the nest and began wading in its direction. When 10 m away he stopped and preened returning to the nest at 1250. At 1255 the female stood up; then both birds began pulling vegetation with their beaks swinging it with a sidewise motion back onto the nest or close to it in the water. At 1305 the male fed 3 m from the nest while the female sat down again. At 1307 she stood up and left the nest wading to the east where she disappeared into taller vegetation. The male silently climbed onto the nest and began incubating. At 1320 he stood up and worked with the eggs 3 minutes. At 1446 he worked with the eggs for one minute and again for two minutes at 1523. At 1644 the female flew in from

the south, landing 5 m south of the nest. She waded around a little then stopped 4 m from the nest, came closer and preened. At 1651 the male stood up and walked off the nest. The female climbed up and sat down. The male began tossing vegetation back toward the nest then went on foot to the southeast end of the pond. At 1835 he flew back eventually ending up 9 m from the nest at the edge of the *Sagittaria*. As it got dark the female continued to incubate as the male stood motionless 9 m away.

During the 12 hours we observed this nest, the female incubated during three periods: (1) probably all night 1-2 March 1984 until 0715 2 March (with the known period of 0638-0715 hrs); (2) from 1034 until 1307 (153 minutes) and (3) from 1651 until 1838 then probably the entire night of 2-3 March. During daylight hours she incubated during periods of 37, 153 and 107 minutes, totaling 297 minutes. The male incubated 0715 until 1034 (199 minutes) and from 1307 until 1651 (224 minutes), a total of 423 minutes. The female worked with the nest and eggs for 9 periods of 20 minutes while the male worked with them for 7 periods or 19 minutes. Thus during the daytime there were 39 minutes during which the birds did not incubate.—**Lawrence H. Walkinshaw**, 5230 Timberlane Road, Lake Wales, Florida 33853.
Florida Field Naturalist 13: 67-68.

Alligator with young threatens Great Blue Heron.—I know of no reports of an alligator (*Alligator mississippiensis*) threatening or attacking a Great Blue Heron (*Ardea herodias*). In this note I report an observation of an alligator driving a heron away from her young, estimated to be 8-9 months of age, by a waterhole on the Hendrie ranch, 24 km south of Lake Placid, Highlands County, Florida. The waterhole, a pool 8 x 20 m, was free of vegetation. Also favoring observations was the tameness of the alligators and heron resulting from my daily visits to the ranch. The alligators moved into the pool on 9 April following several days of rain, preceded by months of drought. Fourteen young alligators, about 36 cm in length, arrived irregularly over the next 3 days. The smaller of the adults (ca 2.3 m in length) was probably a female, as judged by her size and the way she guarded the young (Kushlan 1973, Herpetologica 29: 256-257). Also, on 17 April I watched her rub her throat three times on the back of the head of the larger alligator (length ca 3.3 m), which appeared to be a male, then sink under water on top of him, a form of courtship described by Garrick (1975, Animal Kingdom 78(2):2-8).

On a number of mornings the young climbed onto the grass of a spoil bank to sun themselves, followed by the smaller adult and, to one side, the larger adult. The alligators were in these positions on 18 April when a Great Blue Heron alighted 3 m away, then started walking toward them. The female alligator, rising high on her legs, rushed at the heron with jaws open. The heron, seemingly not much disturbed, turned and moved to the end of the waterhole where it fed by Walking Slowly (Kushlan 1976, Auk 93: 86-94). After returning to her young, the smaller adult alligator slipped down the bank, with head pointed toward the heron, and disappeared under the water. The heron, as if anticipating the alligator's arrival, stood on the shore (Fig. 1a), looking in its direction. After 1-2 min the submerged alligator suddenly made an open-mouthed lunge at the heron (Fig. 1b). Because the alligator did not come very close, I think that she was trying to scare the heron rather than to catch it.

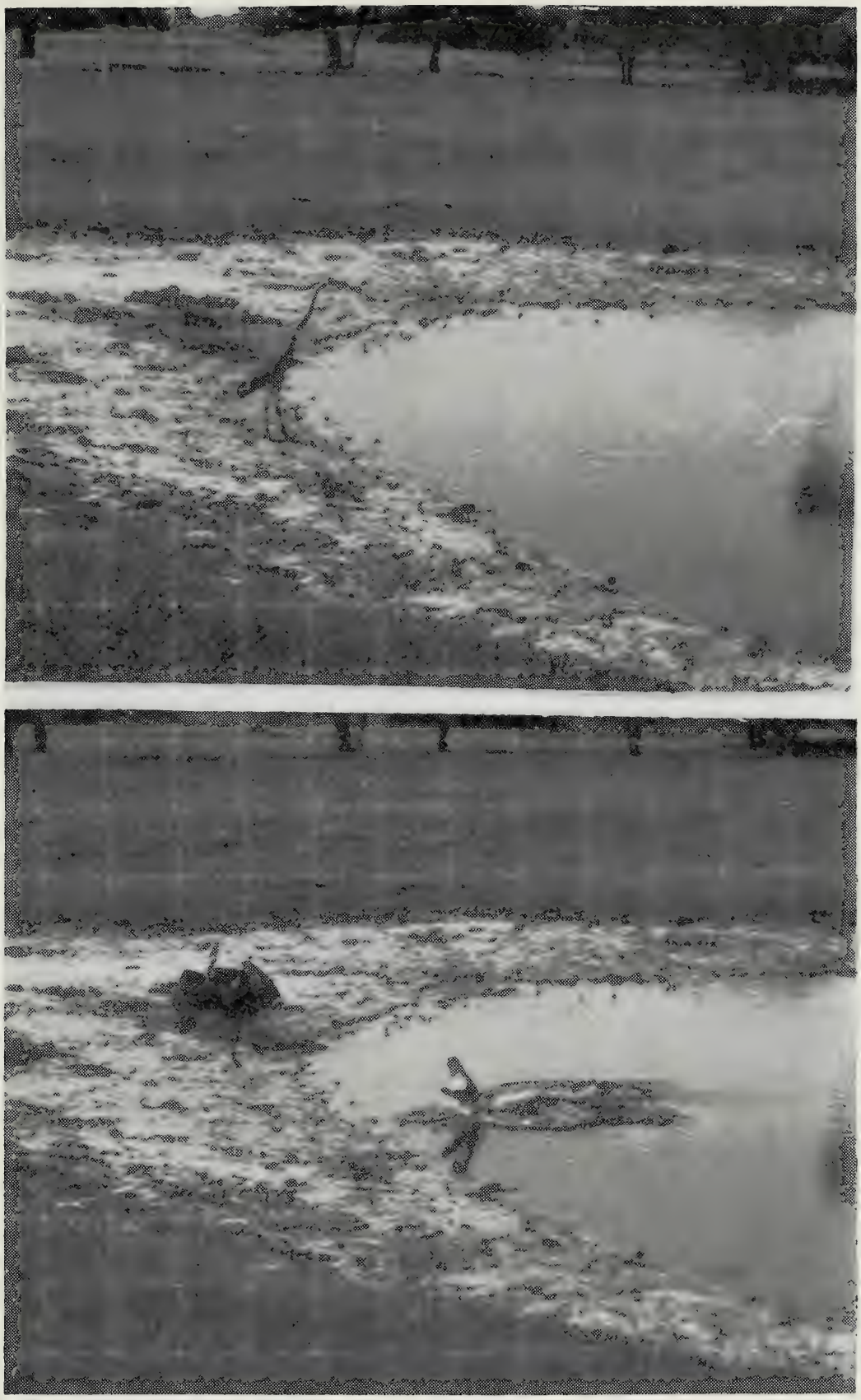

Figure 1. A (Top) Great Blue Heron Looking into Water as if Anticipating Arrival of Alligator. B (Bottom) Female Alligator Making an Opened-mouth Lunge from Submerged Position.

It would be interesting to know if Great Blue Herons are important predators of young alligators and up to what size. The young on the spoil bank did not appear to be too large for, in January 1981, I watched a Great Blue Heron in Georgia swallow a chunky fish that was as long as the young alligators and may have weighed considerably more.

The behavior observed at the ranch, although similar in general, does not exactly fit patterns described by Kushlan and Kushlan (1980, Herpetologica 36: 27-32) of defense by nesting alligators, possibly because situations change as young grow older. The smaller alligator at the ranch defended her young directly when they were on the bank and also the pool as a territory. This latter approach fitted prior observations that the young were apt to swim about the whole of the pool when not sunning themselves on the bank.

I thank James H. Hendrie, Sr. and John D. Hendrie for letting my wife and I visit their ranch and James N. Layne and Fred E. Lohrer of the Archbold Biological Station, Lake Placid, Florida, for general assistance.

Lawrence Kilham, Main St., Box 37, Lyme, New Hampshire.

Florida Field Naturalist 13: 68-70.

REVIEW

Florida atlas of breeding sites for herons and their allies: 1976-78.—Stephen A. Nesbitt, John C. Ogden, Herbert W. Kale II, Barbara W. Patty, and Lesley A. Rowse. 1982. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS-81/49.—This report presents information on heron colonies in Florida east of the Ochlockonee River. Data cover 1976 through 1978 and include 295 identified colony sites and 22 species of colonial waterbirds. The report is organized by county and by colony, with the account for each site including colony location, colony name, site description, and the number of pairs of each species, mostly in April or June of the several years, depending on the information available. The report was printed by the National Coastal Ecosystems Team of the U.S. Fish and Wildlife Service, whose stated purpose was "to aid resource managers and others concerned with the intelligent management of Florida's natural resources." With such an important audience in mind, it is of some value to examine whether the purpose has been met.

The most useful potential contribution of this report is to document the locations of waterbird colonies censused in Florida. For the most part, the locations given for colony sites are approximately correct, especially those located near prominent landmarks. Not all colonies are correctly placed, however, so the best approach for a local conservationist is to use the atlas as a starting point for locating colony sites and then to seek corroborative evidence elsewhere. Also one should not assume that the sites presented represent all of the colonies active in Florida during the years covered, in that the aerial searches for previously unknown colony sites were far from complete. Clearly the listing of colony sites in one report is a contribution, but this atlas must be used cautiously.

With respect to a second potential contribution, the documentation of species composition and nesting numbers, the Atlas ends up doing a decided disservice to its audience, because of its reporting of data marred by unevaluated errors especially resulting from the use of one-shot aerial censuses. The existence of such errors are noted in the Methods section, including my finding that they may be as high as 30-100%. Regardless, census numbers are

presented with no indication of their reliability. This can only serve to trap the unwary user into drawing conclusions based upon data whose implied accuracy is unfounded. Censusing bird populations requires special care in technique selection, data presentation, and analysis, matters well established in the technical literature. In the present report, based upon the methods used, there is no justification for including other than the broadest of ranges of the number of birds observed.

Given the less than complete coverage of the state, the errors inherent in the aerial census technique used for most of the data presented, and the annual and seasonal variation in nesting timing and effort, the statement that "the estimates for Brown Pelicans, Cattle Egrets, Great Blue Herons, Great Egrets, Roseate Spoonbills, White Ibises, and Wood Storks reasonably represent the nesting populations within the area covered" is dangerously misleading to the typical citizen conservationist.

To this we can add the difficulty raised by some of the information being just plane wrong. Good examples may be drawn from the data from Dade and Monroe counties, all of which were obtained without verification by the principal investigator of the census program. Perhaps the most telling example is the colony called "Planaria" (p. 123). The Atlas not only provides a location by both Latitude and Longitude and by Township and Range but also the numbers of two species nesting there. Unfortunately such a colony never existed. This entry somehow derives from a marginal doodle on a field data sheet, which was an attempt to communicate the appearance of an Everglades tree island between observers.

Given the serious problems with accuracy and completeness, one might wonder how a conservationist could check on the information presented. Communication with the persons listed as authors would not necessarily be satisfactory in that information from nearly 25% of the colony sites was supplied by census programs whose participants are not listed as authors. Such lack of attribution makes critical evaluation nearly impossible.

In that such an atlas could be a valuable tool for conservation and resource management, it is of interest to contrast the Florida atlas with one that is, "An atlas and census of Texas waterbird colonies 1973-1980", compiled by the Texas Colonial Waterbird Society, published by the Caesar Kleberg Wildlife Research Institute, 1982. This census was undertaken by 159 co-operators mostly amateurs, demonstrating a confidence in non-professionals sadly lacking in any Florida program. The ten professionals co-ordinating the work are listed as compilers not authors. Airplanes were used primarily to locate colony sites, and most counts especially along the coast were done on the ground, the only appropriate census technique for colonial wading birds. Aerial data are clearly identified. Thus the census data provided can be used with known confidence by various interested parties. Should verification be necessary, the name of the person contributing each census is provided. This also permits the data to be credited to his or her hard work.

The statewide survey program in Texas is now over a decade old, and a model of co-operation, the use of dedicated amateur ornithologists, and adherence to standards of wildlife censusing. It is truely a shame that Florida lacks such an independent program and so has been denied a trustworthy atlas of waterbird colonies.—**James A. Kushlan**, Department of Biological Sciences, East Texas State University, Commerce, Texas 75428.

REPORTS

FLORIDA ORNITHOLOGICAL SOCIETY, INC. TREASURER'S REPORT, 1984

TOTAL FUND BALANCE. Cash in banks at year-end

	1983		1984
Checking accounts	$ 6,871.12	Checking accounts	$11,448.04
Research certificate	1,543.88	Research certificate, #1	1,772.15
Capital certificate	2,513.39	Research certificate, #2	1,400.00
	$10,928.39	Capital certificate	2,884.97
			$17,505.16

1984 CASH RECEIPTS AND DISBURSEMENTS

TOTAL FUND BALANCE, 1 January 1984 ..... $10,928.39

Cash Receipts		*Cash Disbursements*	
Membership dues	$ 7,647.00	Membership	$ 221.57
Meetings	3,378.25	Meetings	2,846.38
FFN	1,980.13	FFN	4,657.13
Special Publication Fund	29.25	Special Publication Fund	85.10
Special projects	78.50	Special projects	200.00
Interest earned	1,632.21	Operating	435.22
Research fund	812.25	Newsletter	535.67
	$15,557.84		$ 8,981.07

TOTAL FUND BALANCE, 31 December 1984 ..... $17,505.16

ACTUAL INCOME AVAILABLE FOR USE DURING 1984

TOTAL CASH RECEIPTS, 1984 ..... $15,557.84

Add 1984 dues received before 1/1/84	$ 315.00	
Less 1985/6 dues received before 1/1/85	2,726.00	
Less Research Fund receipts & interest, 1984	1,176.25	
Less Special Publication Fund receipts & interest, 1984	126.45	
Less FFN Fund receipts & interest, 1984	163.28	
ACTUAL INCOME, 1984		$11,680.86
CASH DISBURSEMENTS, 1984		8,981.07
EXCESS INCOME OVER DISBURSEMENTS, 1984		$ 2,699.79

19 April 1985.—**Caroline H. Coleman**, Treasurer, 1701 NW 24th St., Gainesville, FL 32605.

Summary of the 1985 spring meeting.—The annual meeting of the Florida Ornithological Society was held in conjunction with the Florida Chapter of The Wildlife Society in Gainesville, Florida from 19-21 April 1985. Stephen Nesbitt and the local committee from the Wildlife Research Laboratory of the Florida Game and Fresh Water Fish Commission hosted the meeting. On Friday evening a quiz on the identification of bird remains, prepared by Dave Maehr, challenged members. Wayne Hoffman won first prize by identifying 80% of the specimens and Herb Kale took second place. There were morning field trips to San Felasco Hammock, Devil's Millhopper, and Paynes Prairie State Preserve. The technical paper session included papers on "Recent development in Anseriform fauna in Florida" by Frank Montalbano, "Reproductive recycling in Florida bald eagles" by John Roser, "Frog distribution and identification in Florida" by Paul Moler, "Waterfowl on the wing and in the hand: identification pointers" by Jim Thul, and progress on Florida's breeding bird atlas by Herb Kale.

At the meeting of the board of directors, Henry Stevenson was appointed to direct the search for a new editor for the FFN, to begin with the 1987 issue; board members voted to support the efforts of Bill and Helen Dowling to provide pelagic trips for birders; and Glen Woolfenden was appointed as representative on the Breeding Bird Atlas committee. Reed Noss was selected as the first Research Award Recipient. Noss will study the between-habitat interactions and avifauna in a north-central Florida forest patches. Oron Bass, chairman of the nominating committee, recommended: Bob Brown, President; Dave Goodwin, Vice President; Bruce Neville, Secretary; Caroline Coleman, Treasurer; and Jane Brooks, Rich Paul, and William B. Robertson as board members. The nominees were unanimously elected at the annual meeting of the membership. Lohrer extended our thanks to President Kittleson for her excellent leadership. Members gathered at the Wildlife Research Laboratory on Saturday evening for a barbecue buffet.

The 1985 fall meeting will be held in Orlando, 13-15 September, with Dorothy Freeman, Orange Audubon Society, as the chairman. Tom Bancroft has invited FOS to Plantation Key on 2-4 May 1986.—**Marsha S. Winegarner,** 2360 Old State Road Eight, Venus, Florida 33960.

FLORIDA ORNITHOLOGICAL SOCIETY SPECIAL PUBLICATIONS

Species index to Florida bird records in Audubon Field Notes and American Birds volumes 1-30 1947-1976, by Margaret C. Bowman. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00.

The Carolina Parakeet in Florida, by Daniel McKinley. 1985. Florida Ornithological Society, Special Publication No. 2. Price $6.00.

Order prepaid from the Treasurer

INFORMATION FOR CONTRIBUTORS TO THE FLORIDA FIELD NATURALIST

The Florida Field Naturalist is a quarterly publication of the Florida Ornithological Society. It is a fully refereed technical journal of field biology and natural history. Its contents are listed or abstracted in prominent bibliographic sources including: Biological Abstracts (BIOSIS); Zoological Record; American Ornithologists' Union and British Ornithologists' Union Recent Literature Supplement; Wildlife Review; Swiss Wildlife Information Service Key Word Index; Recent Literature in Mammalogy; and Recent Herpetological Literature.

The Florida Field Naturalist welcomes submission of articles and notes containing the results of biological field studies, distributional records, and natural history observations of vertebrates, especially birds. Its geographic area includes Florida, adjacent states, the Bahamas, and nearby West Indies.

A manuscript submitted for consideration should be sent to the Editor at the address on the cover of a recent issue. When preparing a manuscript, authors should carefully follow the style requirements presented below and illustrated in recent issues of the journal. In that each manuscript is reviewed by several technical authorities who advise the editor on its style, contents, contribution to knowledge, and acceptability for publication, an author should submit three copies to the editor.

The Florida Field Naturalist follows the conventions set forth in the CBE style manual, 1983, available from the Council of Biology Editors, Inc., 9650 Rockville Pike, Bethseda Maryland 20814. An author can also consult the format and style of the most recent issue of the FFN.

Articles are contributions of six to twenty-five typed pages. For publication of longer articles, payment of page charges may be necessary. Articles should be divided into several sections. An abstract should recapitulate the basic finding and interpretations and should be able to stand alone in describing the results of the paper. An introduction should describe the study and its contribution to knowledge. A Methods section should include a description of how the study or observations were accomplished including references to any statistics or unusual nomenclature used. If appropriate, a Study Area section should provide a description of the site of the investigation. The Results should be a concise presentation of the findings of the study, using tables, figures, and statistical analysis where appropriate. The Discussion should relate the findings to previous knowledge and elaborate on their importance. In an Acknowledgements section, the author can recognize the contributions of coworkers, the help of reviewers of the manuscript, and any financial support for the study. A Literature Cited section lists all references cited in the text of the paper.

Notes are contributions of fewer than six typed pages. Such manuscripts should follow the outline given above but the sections are not labeled. Notes do not have an abstract, but must conclude with a summary paragraph.

Care in preparation of a manuscript is essential. Type on one side of 8½ x 11 inch white paper. Do not use erasable bond because it will smear. It is essential to leave space for editorial comments, alterations to text, and instructions to the printer. Therefore type everything double space, including titles, addresses, literature cited, and tables. Also leave at least one inch margin all around. Type tables on separate sheets, using space efficiently.

Diagrams, charts, and line drawing must be of professional quality. This can be accomplished by using black India ink and drawing guides. Use transfer lettering, which can be purchased in stationery stores, or mechanical lettering guides. Choose a bold, clear lettering style such as Helvetica Medium. When the figure is reduced, the letters should be no smaller than 1 mm, so chose lettering size accordingly. Look at recent issues of the journal, or other ornithological journals, for ideas on composition of tables and figures. The submission of photographs pertinent to the paper is encouraged, although no fees can be paid. They should be glossy black and white prints of high contrast and sharpness and about the same size as they will appear in print, either 4 x 3 inches or 4 x 6 inches. Such prints can be made from high quality color slides, and an author should consult a photography store about having photographs printed for publication. Further information on scientific illustration may be found in a pamphlet by A. Allen, Steps toward better scientific illustrations, available from Allen Press, Lawrence, Kansas 66044.

Use of the literature requires special care. All literature cited must be verified by examination of the original reference, or the lack of such verification must be noted. If more than five references are cited they should be listed alphabetically in a Literature Cited section. Format follows the CBE style manual, 1983, with the date placed after the author's name. Abbreviate journal names according to the BIOSIS list of serials (BioSciences Information Service, 2100 Arch Street, Philadelphia, Pennsylvania 19103), or consult recent issues of the Florida Field Naturalist. If there are five or fewer references, give a shortened citation only in the text on its first use, e.g. "(Howell 1932, Florida bird life, New York: Coward-McCann)" for books or "(Kilham 1984, Fla. Field Nat. 12:25-31)" for journal articles. Otherwise cite references in text as part of the sentence, e.g. "Howell (1932) stated that . . .," or parenthetically, e.g. "(Howell 1932)." Cite two authors in text as "(Robertson and Kushlan 1974)"; cite more than two authors in text as "(Sykes et al. 1984)." Pay special attention to crediting observations reported in Regional Reports in American Birds. Where such information is available, cite the observer in text or tables in addition to the Regional Editor, e.g., "(F. Moore *in* Stevenson 1973)" or "(many observers *in* Stevenson 1973)".

Express all measurements in units of the SI System (Système International d'Unités). These units are weight in gram (g) or kilogram (kg), length in metre (m), or kilometre (km), time in second (s), area in square metre (m^2) or hectare (ha), speed in metre per second (ms^{-1}), energy in joule (J), and power in watt (W). See a dictionary for conversion factors. If desired in addition, the equivalent value in the English system may be provided parenthetically. Use abbreviations for measurement units in text when they follow a quantity (2 km, 12 ha, 90 s). Unless they are followed by such a measurement unit, spell out numbers less than ten, e.g. six birds but 6 m. Use the 24-hour time system and the military date system. That is, use "0306 of 13 September 1984" for 3:06 A.M., September 13, 1984 and use "1506 of 13 September 1984" for 3:06 P.M., September 13, 1984.

In naming organisms follow standard taxonomic works for each group. Capitalize the common names of birds, and follow The AOU check-list of North American birds, sixth edition, 1983, and subsequent supplements for scientific names. Do not capitalize the common names of other vertebrates or plants. For reptiles and amphibians use Collins et al., 1982, Standard common and current scientific names for North American amphibians and reptiles,

second edition, Society for the Study of Amphibians and Reptiles Herpetological Circular 12. For fishes use Robins et al., 1980, A list of common and scientific names of fishes from the United States and Canada, fourth edition, American Fisheries Society Special Publication 12. For other animals and plants cite the sources used for common and scientific names in the Methods section. Give the scientific name of each organism, underlined and in parentheses, when it is first mentioned in text or in a table. Thereafter use common names if possible.

The Florida Field Naturalist encourages the submission of reports on the changing distribution and occurrence of rare species in its geographic area. All sight records of occurrences of birds in Florida submitted for publication are reviewed for acceptability by the Records Committee of the Florida Ornithological Society. Prior or simultaneous submission of a record to the committee on its standard form will decrease the time and expense required to consider it for publication. Notices of a record in American Birds, newsletters, or Records Committee reports do not preclude submission of a paper with additional details to the Florida Field Naturalist, but previous notices should be cited. All reports must contain the time, place (including county), circumstances, and documentation of the observation sufficient to assure proper identification was made. Specimens and photographs should be deposited in a scientific collection. Give their accession numbers in text. The Florida State Museum is the official depository for the Florida Ornithological Society. Citations of other pertinent records, a summary of overall status of the species, and a discussion of relevant biological factors should be part of most reports. Distribution notes are encouraged from observers who have not previously written such reports. If presubmission assistance with distribution notes is desired, contact the Associate Editor (for distribution reports), who can provide advice on the desirability of submission, information to be included, format of presentation, and composition of the note prior to submission for the editor's consideration.

The Florida Field Naturalist especially encourages submission of behavioral notes and the results of scientific field studies. Notes on behavior need not be the first published report but should take into consideration previously published information. Consideration should also be given to interpreting the biological, ecological, or evolutionary significance of the behavior reported. Field studies must conform to standard scientific criteria for study design, analysis, and interpretation. Hypotheses should be clearly stated and data should be subjected to statistical testing where appropriate. Presubmission advice on the writing of scientific studies can be sought from the Associate Editor (for scientific reports).

The Florida Field Naturalist presents reviews of books, monographs, and other material of interest to its readers. Materials to be considered for review should be sent to the Associate Editor (for reviews). Unsolicited reviews may also be submitted to the Associate Editor (for reviews). An annotated list of scientific articles referring to Florida birds is published annually. Authors wishing to have papers included in this feature should send reprints to the Special Editor of this feature.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The Florida Field Naturalist is a fully refereed journal emphasizing biological field studies and observations of vertebrates, especially birds, in and near Florida and the nearby West Indies. It welcomes submission of manuscripts containing new information from these areas. Please consult recent issues for style, and Vol. 13, No. 3 for detailed information. Submit manuscripts for consideration to the editor James A. Kushlan. Monograph-length manuscripts may be submitted for consideration to the Editor of Special Publications John William Hardy. Send books and other materials for review to Associate Editor Oscar T. Owre. Send copies of recent literature on Florida birds to Special Editor Fred E. Lohrer. For preliminary assistance regarding submission of manuscripts dealing with bird distribution and rarities contact Associate Editor Howard P. Langridge. Reports of rare birds in Florida should also be submitted to the FOS Records Committee Secretary Peggy Powell. For preliminary assistance regarding submission of scientific, technical, or behavioral contributions contact Associate Editor James A. Rodgers.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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All members receive the Florida Field Naturalist and the Newsletter. Subscription price for institutions and non-members is $10 per year. Back issues ($3.00 per issue) are available, prepaid, from the Treasurer. Notice of change of address, claims for undelivered or defective copies of this journal, and requests for information about advertising and subscriptions should be sent to the Treasurer.

The Florida Field Naturalist is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 14, NO. 4 NOVEMBER 1985 PAGES 77-104

THE BIRDS OF ELEUTHERA ISLAND, BAHAMAS

HAROLD A. CONNOR AND ROBERT W. LOFTIN
249 Canis Drive, W., Orange Park, Florida 32073 and
University of North Florida, 4567 St. John's Bluff Road,
Jacksonville, Florida 32216

Abstract.—In this paper we report on the avifauna of Eleuthra Island, Bahamas, based upon over five years of field observations. Included are accounts of 205 species, 31 new to the island, nine new to the Bahamas, and three new for the West Indies.

The birds of the Bahama Islands remain superficially known, owing to a paucity of comprehensive faunistic work or long-term observations in any one place. Available faunistic summaries include those of Bond (1956, 1974 and annual Supplements 1-25, 1956-1984); Brudenell-Bruce (1975) and the Florida Audubon Society (1968). Other than on New Providence, the birds found on specific islands are particularly poorly documented, and to our knowledge no long-term studies have been published on the relatively large island of Eleuthera. In this paper we report on observations of the avifauna of Eleuthera made over a five year period.

METHODS

Connor observed birds on Eleuthera (Fig. 1) between May 1971 and May 1973, and again between April 1976 and June 1979. He was attached to the U. S. Naval Facility, so most of his birding was from Ten Bay to James Cistern, but he covered the whole island several times. Between November 1978 and April 1979 he tended mist nets under the direction of Paul A. Stewart, on a study of the Palm Warbler (*Dendroica palmarum*). Although only Palm Warblers were banded, he caught and made notes on many other land birds. All the field work reported in this paper was done by Connor. Loftin searched the literature, did the actual writing, and saw the paper through the editorial process.

RESULTS

The list of birds observed is given below. The nomenclature is that of the 6th edition of the AOU Checklist (1983). We categorized the species as follows: Common - hard to miss; Uncommon - found when looked for; Scarce - appears in small numbers but may not be present every year; Rare - very difficult to find; Accidental - birds which are out of normal distribution or migratory range.

Florida Field Naturalist 13: 77-93.

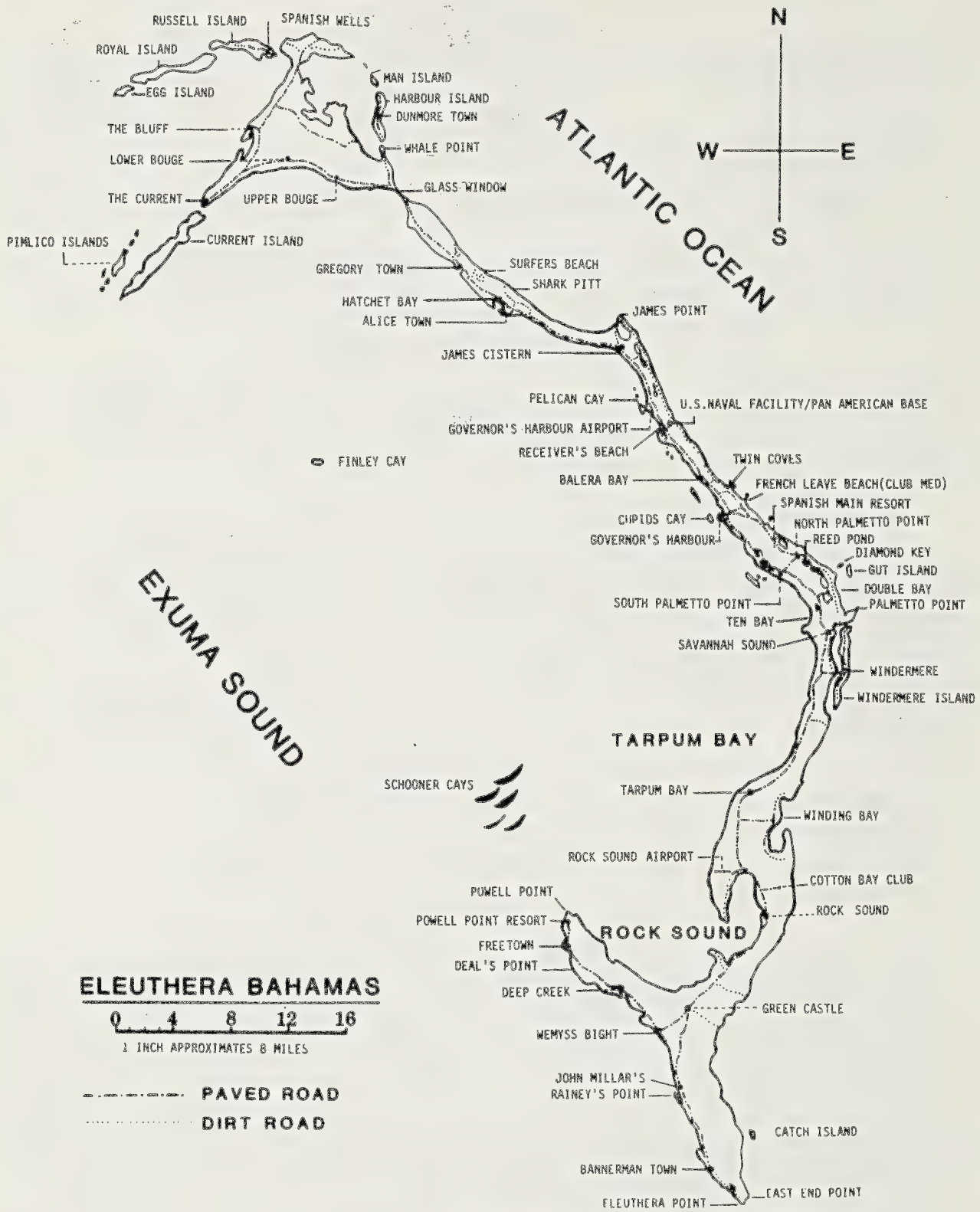

Figure 1. Map of Eleuthera, Bahamas.

Least Grebe (*Tachybaptus dominicus*) is an uncommon permanent resident. This nesting species is found primarily on small natural and man-made fresh water ponds, especially along the Old Queen's Highway between north Palmetto Point and Double Bay, and at Twin Coves.

Pied-billed Grebe (*Podilymbus podiceps*) is a common winter and rare summer resident. A pair was present in the third small pond SE of North Palmetto Point along the Old Queen's Highway during the summer of 1977. No positive evidence of breeding was obtained, but the birds were in breeding plumage, calling and obviously paired. Generally found in the larger saltwater ponds in winter, especially the one NW of the Palmetto Point intersection along the Queen's Highway.

White-tailed Tropicbird (*Phaethon lepturus*) is an uncommon summer resident from 21 May to 17 September. Four to six pairs nested in the cliffs just north of the Glass Window on the Atlantic (eastern) side of the island.

Brown Pelican (*Pelecanus occidentalis*) is an uncommon straggler year round for which we have no breeding records. Seen primarily in harbors. Generally one to several birds could be found at "The Current" on the north end of the island.

Double-crested Cormorant (*Phalacrocorax auritus*) is a common permanent resident. Forty to sixty pairs nest in the big salt pond NW of Palmetto Point Intersection along the Queen's Highway.

Olivaceous Cormorant (*Phalacrocorax olivaceus*) is a common summer resident seen from 19 March to 28 October. It may breed. Although no nests were found, immature birds, which may have been reared locally, are often seen in the fall. The species breeds on San Salvador and Great Inagua and there is probable a colony at Cat Island (Bond, 23rd Supplement, 1980). Frequently seen in the man-made ponds at Twin Coves (20 to 30 birds) and at Double Bay. There are no previous records for Eleuthera. Photographs are available.

Magnificent Frigatebird (*Fregata magnificens*) is a common summer and rare winter resident. A nesting colony, c. 40 pairs, is on Gut Island.

American Bittern (*Botaurus lentiginosus*) is a scarce winter resident from 4 November to 14 March. Found in reeds around fresh water ponds, especially the pond NE of North Palmetto Point.

Least Bittern (*Ixobrychus exilis*) is a rare visitor. One record on 6 October 1977, between North Palmetto point ballfield and a nearby reed pond.

Great Blue Heron (*Ardea herodias*) is an uncommon fall, winter, and spring resident, but rare or absent from late May through early August. Not known to breed.

Great Egret (*Casmerodius albus*) is a common fall, winter, and spring resident; rare or absent in summer. Not known to breed.

Snowy Egret (*Egretta thula*) is a common fall, winter, and spring resident; rare or absent in summer. No breeding records.

Little Blue Heron (*Egretta caerulea*) is a common fall, winter, and spring resident; some moulting immature birds spend the summer. No breeding records.

Tricolored Heron (*Egretta tricolor*) is a common permanent resident, nesting on small offshore islands and keys such as Gut Island.

Cattle Egret (*Bubulcus ibis*) is a common permanent resident, suspected of nesting, though no nests have been found. Flocks of 75 to 125 birds in breeding plumage can be found in the Hatchet Bay farm and dairy area.

Green-backed Heron (*Butorides striatus*) is a common permanent resident, nesting near ponds and on offshore cays.

Yellow-crowned Night-Heron (*Nycticorax violaceus*) is a common permanent resident, nesting on the more densely vegetated offshore cays.

White Ibis (*Eudocimus albus*) is a rare straggler to the island. A single immature bird was noted 12 November 1977, and stayed in the ponds near the town of James Cistern until 19 November 1978 while moulting to adult plumage. There are no other records for the island, though it is presumed to occur throughout the Bahamas as a straggler from Florida. Identifiable photographs are available.

Glossy Ibis (*Plegadis falcinellus*) is a sporadic visitor in fall, winter, and spring. Up to 17 have been seen at one time in the ponds near James Cistern.

Greater Flamingo (*Phoenicopterus ruber*) is a sporadic visitor from 19 September through 3 April. There are no previous records of this species on Eleuthera, though it is assumed to be vagrant throughout the Bahamas from the breeding colonies on Great Inagua, Andros, and Abaco. Photograph available.

Fulvous Whistling-Duck (*Dendrocygna bicolor*) is a rare straggler. Four birds were seen on 6 September 1976 in a small freshwater pond near Governor's Harbor airport. There are no other records for Eleuthera, though it has occurred on other islands in the Bahamas.

West Indian Whistling-Duck (*Dendrocygna arborea*) is a rare visitor. Six birds were seen on 9 November 1978 in the deepest of the man-made ponds at Twin Coves. There are no other records for Eleuthera, though it has been recorded on Andros and San Salvador and breeds on Great Inagua (Don Buden, pers. com.). Photographs are available.

Canada Goose (*Branta canadensis*) is an accidental. One bird stayed from 17 December 1977 until 4 January 1978 in the third pond SE of North Palmetto Point along the Old Queen's Highway. Though hunters stated they have seen others on the island, there is no previous record for the Bahamas.

Wood Duck (*Aix sponsa*) is a rare straggler. We have one record, 18 December 1976 of an adult male in brilliant plumage, north of Ten Bay along the western shore.

Green-winged Teal (*Anas crecca*) is an uncommon winter resident, from 6 November to 27 February. Found in the ponds along the eastern ridge of the island between Governor's Harbor airport and James Cistern. Most authorities have assumed that this duck is merely a passage migrant in the Bahamas. This is the first winter record for Eleuthera.

White-cheeked Pintail (*Anas bahamensis*) is an uncommon spring, summer, and fall resident from 11 March to 4 December. It breeds in ponds along the Old Queen's Highway between North Palmetto Point and Double Bay. Connor has photographs taken at a distance, in which the bird is indentifiable.

Northern Pintail (*Anas acuta*) is a common winter resident from 13 September to 7 February. It is found most often in ponds near James Cistern. Though regarded as a passage migrant in the Bahamas by most authorities, this species winters on Eleuthera. There are no other records for the island.

Blue-winged Teal (*Anas discors*) is a common fall, winter and spring resident on ponds throughout. From 25 July to 8 April it is the most abundant duck on the island. A few birds injured by hunters may be present in summer.

Northern Shoveler (*Anas clypeata*) is an uncommon winter resident from 28 September through 3 March. From 6 to 25 each year can be found in ponds between Governor's Harbor airport and James Cistern, and in the third pond along the Old Queen's Highway SE of North Palmetto Point.

Gadwall (*Anas strepera*) is a rare winter visitor from 13 September to 2 March. It is found primarily in the ponds near James Cistern. Though Bond (1974) lists it for the Bahamas and Brudenell-Bruce (1975) has it as an occasional winter visitor on New Providence, there are no other records for Eleuthera.

American Widgeon (*Anas americana*) is a sporadic winter visitor from 20 September to 12 April. It is found in both fresh and salt water ponds in the Double Bay area and in ponds from Double Bay to James Cistern along the Old Queen's Highway.

Canvasback (*Aythya valisineria*) is a rare winter visitor from 20 November to 3 January. Noted in the small ponds between Governor's Harbor airport and James Cistern. There are no other records for the Bahamas.

Redhead (*Aythya americana*) is a rare winter visitor. Seen by Connor on 20 November 1977 in a small pond near Governor's Harbor airport. According to Brudenell-Bruce (1975), this species was said to have been the most abundant duck on New Providence in 1859, but there are no recent records. This observation is the only recent one for the Bahamas and the only one for Eleuthera.

Ring-necked Duck (*Aythya collaris*) is a common winter resident from 21 October to 19 March. It is found on larger ponds throughout the island, especially the big ponds at Double Bay, varying greatly in numbers from year to year.

Greater Scaup (*Aythya marila*) is an accidental. Connor saw one on 31 January 1972 in a pond near James Cistern. According to Bond (1974), this species was recorded on New Providence 31 January 1971, with questionable records from Watling's Island, Rum Cay and Cuba. There are no previous records for Eleuthera.

Lesser Scaup (*Aythya affinis*) is a common winter resident from 31 August to 20 April. It is found in larger ponds throughout the island, especially those at Double Bay.

Bufflehead (*Bucephala albeola*) is an accidental. From 24 December 1976 to 9 January 1977 a female stayed in a small pond between Governor's Harbor and James Cistern. This is the only record for the Bahamas and for Eleuthera.

Hooded Merganser (*Lophodytes cucullatus*) is an uncommon winter resident from 27 November to 9 January. A few can be found on freshwater ponds throughout the island, especially those near James Cistern. Brudenell-Bruce (1975) lists the species as an occasional winter visitor to New Providence. He mentions one record from Grand Bahama and a probable record from North Eleuthera in February.

Reb-breasted Merganser (*Mergus serrator*) is a rare winter visitor. One seen 1-15 March 1972 on a small pond NW of Governor's Harbor airport. This is the only record for Eleuthera.

Ruddy Duck (*Oxyura jamaicensis*) is an uncommon permanent resident. Six to eight birds generally can be found all year in a sulphur pond near Spanish Main resort, and another small group in the third pond SE of North Palmetto Point. Five downy young were observed at the sulphur pond 25 August 1976. Four of these were reared to maturity. Young were also observed at the other pond. These observations are the first records of breeding on Eleuthera. Schwartz and Klinikowski (1965) have discussed the subspecies of this bird on Eleuthera. The fact that the species breeds here would tend to indicate that most seen here are *O. j. jamaicensis* rather than migrant *O. j. rubida* from the continent.

Osprey (*Pandion haliaetus*) is a common winter resident from 1 September to 16 April. Found primarily at Ten Bay and Twin Coves.

American Swallow-tailed Kite (*Elanoides forficatus*) is an accidental. We have one record, 1 March 1978. There is not other record for Eleuthera or the Bahamas.

Northern Harrier (*Circus cyaneus*) is a scarce winter resident from 8 October to 11 March. It is usually found soaring over fields and pastures at Hatchet Bay Farms and the Black Angus ranch NE of Rock Sound.

American Kestrel (*Falco sparverius*) is a common winter resident from 23 September to 2 May. Generally found on power lines or fences in the vicinity of pastures and other open areas.

Merlin (*Falco columbarius*) is a scarce winter resident from 15 September to 22 April. This species may show up anywhere on the island.

Peregrine Falcon (*Falco peregrinus*) is a scarce winter visitor from 2 October to 8 March. A maximum of 3 in one day has been seen, generally around the Governor's Harbor airport and along the beaches.

Ring-necked Pheasant (*Phasianus colchicus*) is an introduced permanent resident. The birds are now breeding in the wild and are common in the Hatchet Bay area where they are becoming a nuisance to farmers.

Clapper Rail (*Rallus longirostris*) is an uncommon permanent resident, seen most frequently around the ponds near James Cistern where it may nest. It is most readily seen during the dry season when it crosses or feeds on the exposed mud flats of the ponds and lakes.

Virginia Rail (*Rallus limicola*) is an accidental. Connor saw an immature, crossing the road NW of the Palmetto Point intersection near the large salt water pond on 4 March 1972. This is the only record for the Bahamas. According to Bond (1974) the only other record for the West Indies was 16 October on Cuba.

Sora (*Porzana carolina*) is a common winter resident from 18 September to 17 April. It is found around small fresh water ponds throughout the island.

Common Moorhen (*Gallinula chloropus*) is an uncommon permanent resident. This species nests in fresh water ponds, especially the third, fourth and fifth ones along the Old Queen's Highway SE of North Palmetto Point.

American Coot (*Fulica americana*) is a common winter and uncommon summer resident. In winter, large numbers (200-300, maximum 1100) can usually be found in the ponds near James Cistern. The third and fourth ponds SE of North Palmetto Point also have large concentrations. Occurs in the larger ponds in summer, but no evidence of nesting has been found, though Connor suspects that they do nest. Reported breeding on New Providence (Brudenell-Bruce 1975).

Limpkin (*Aramus guarauna*) as late as the mid-1970's was only a vagrant in the Bahamas, (Bond 1974, and Brudenell-Bruce 1975) but since then it has apparently established itself on Eleuthera. Bond (24th Supplement, 1982) mentions two found dead and photographed near Gregory Town 22 December 1979. Mrs. Delbert Ruch of Gregory Town first saw them there in the spring of 1979 (Bond, 23rd Supplement, 1980). Connor found it to be an uncommon permanent resident. From 10 to 20 birds, in groups of 2-6, could often be found feeding on land snails along the edge of scrub where clearing was in progress near Gregory Town. According to Bond (1956), there are two subspecies known from the West Indies, *A. g. pictus* of Cuba, Jamaica, and Florida and *A. g. elucus* of Hispaniola and Puerto Rico. The latter is said to be more of a forest bird, so those on Eleuthera may well represent this form.

Black-bellied Plover (*Pluvialis squatarola*) is a common winter and uncommon non-breeding summer resident.

Wilson's Plover (*Charadrius wilsonia*) is a premanent resident. It is common in summer but there are fewer in winter. It nests on the many white sandy beaches and in bare pebbly areas around ponds.

Semipalmated Plover (*Charadrius semipalmatus*) is a common winter resident, rare or absent in summer. It can generally be found along the beaches and on the edges of larger salt water ponds with exposed banks or mud flats. Does not nest.

Piping Plover (*Charadrius melodus*) is an uncommon winter resident from 24 July to 19 April. A maximum of 8 seen in one day, generally along the beaches.

Killdeer (*Charadrius vociferus*) is a common permanent resident which is more abundant in winter. Nests in grassy areas near ponds. Can readily be found at the Cotton Bay Club Golf Course at Rock Sound.

American Oystercatcher (*Haematopus palliatus*) is a resident, uncommon in winter and rare in summer; probably breeding. No nests were found but immature birds were seen with adults in the fall.

Black-necked Stilt (*Himantopus mexicanus*) is common in spring, summer and fall; absent in winter. Found from 5 March to 12 November. Nests in shallow water at the edges of ponds. Most small bodies of fresh water will have at least one pair.

American Avocet (*Recurvirostra americana*) is a rare fall visitor. Seen 24 October 1976 in a pond SE of North Palmetto Point on the Old Queen's Highway, and 2 October 1978 in the large shallow pond near James Cistern. The only previous record for the Bahamas is a bird on Andros 30 June (Bond 1974). Photographs are available.

Greater Yellowlegs (*Tringa melanoleuca*) is a common transient and winter resident, absent in June and early July. Found primarily in the large ponds near James Cistern and in ponds between North Palmetto Point and Double Bay.

Lesser Yellowlegs (*Tringa flavipes*) is a common transient and winter resident, absent in June. Found primarily in the large ponds along the Old Queen's Highway between North Palmetto Point and Double Bay.

Solitary Sandpiper (*Tringa solitaria*) is an uncommon fall and scarce spring transient, 5 August to 18 November and 9 April to 5 May. Found primarily in small secluded ponds along the eastern side of the island from James Cistern to Ten Bay.

Willet (*Catoptrophorus semipalmatus*) is an uncommon permanent resident, becoming abundant during spring migration. Connor suspects it of breeding, for he observed copulation, though no nests or young were found. Primarily noted in larger ponds and along beaches.

Spotted Sandpiper (*Actitis macularia*) is a common transient and winter resident, absent in June and early July. It may be found feeding along the edges of any pond or small body of water.

Upland Sandpiper (*Bartramia longicauda*) is a fall migrant. We have one record of a single bird which stayed along the edges of the mowed grass on the Pan American Base, 24 to 30 October, 1977.

Whimbrel (*Numenius phaeopus*) is an uncommon winter resident from 24 July to 2 May. Only one or two birds seen at a time in the larger ponds near James Cistern. There are no previous records for Eleuthera.

Eurasian Curlew (*Numenius arquata*) is an accidental. A single bird was present from 1 January to 19 March 1972 near Governor's Harbor. Connor first believed this bird was a Long-billed Curlew (*N. americanus*), but when the bird was flushed, the white rump and triangle up the back could be seen clearly. This is the first record of this species for the West Indies (Paul Sykes, pers. com.).

Ruddy Turnstone (*Arenaria interpres*) is an uncommon winter resident, with a few nonbreeders lingering over the summer. Found along beaches and rocky shores of larger ponds.

Red Knot (*Calidris canutus*) is a scarce fall and spring migrant; 19 September to 2 October and 8 May. Noted primarily in the Double Bay area and at Windermere Island. There is no previous record for Eleuthera, though it was recorded on Harbour Island 11 November 1961 (Brudenell-Bruce 1975) which lies only a few hundred yards off the northern end of Eleuthera.

Sanderling (*Calidris alba*) is a common winter resident from 30 July to 29 May. Found primarily along beaches.

Semipalmated Sandpiper (*Calidris pusilla*) is a common transient and possible winter resident; 10 August to 22 May. It is found primarily on the mudflats of the larger ponds near James Cistern and at Double Bay.

Western Sandpiper (*Calidris mauri*) is a common transient and winter resident from 7 August to 22 May. It is found primarily on the mud flats of the larger ponds near James Cistern and at Double Bay.

Least Sandpiper (*Calidris minutilla*) is a common transient and winter resident from 10 July to 24 May. Found on most shallow ponds with exposed mud flats, especially those near James Cistern and Double Bay.

White-rumped Sandpiper (*Calidris fuscicollis*) is a scarce fall transient from 12 September to 22 October. A few birds are noted each fall at the catchment basin on the U. S. Naval Facility. Observed once on the mud flats of the large pond near James Cistern.

Baird's Sandpiper (*Calidris bairdii*) is an accidental. One was observed closely on 3 October 1976 while feeding with Western and White-rumped Sandpipers at the bottom of the catchment basin on the Pan American side of the U. S. Naval Facility. This species is new for the Bahamas, and there are only two other records for the West Indies, both from Barbados (26 August and 5 November, Bond 1974).

Pectoral Sandpiper (*Calidris melanotos*) is a scarce fall transient from 14 August to 19 October. It is found primarily on freshly planted or newly mown fields. Photographed in the Pan American catchment basin.

Dunlin (*Calidris alpina*) is an uncommon winter visitor from 18 September to 28 March. It is found primarily in the large pond with mud flats near James Cistern. Though recorded on several other islands (Bond 1974, and Brudenell-Bruce 1975) there are no other records for Eleuthera.

Stilt Sandpiper (*Calidris himantopus*) is a regular spring and irregular fall migrant, 21 July to 27 August and 3 April to 10 May. Found primarily in the large ponds at Double Bay.

Short-billed Dowitcher (*Limnodromus griseus*) is a common winter and rare summer resident, 10 July to 4 June, generally absent from late May through early June. Can be found feeding in most shallow ponds.

Common Snipe (*Gallinago gallinago*) is a common winter resident from 2 October to 4 March. Found in wet areas of pastures and around ponds. The area between North Palmetto Point Ball Field and the Reed Pond is a good place to look for this species.

Laughing Gull (*Larus atricilla*) is a common permanent resident which is more abundant in winter when flocks of 80+ birds can be seen feeding offshore on the western side of the island. Suspected of nesting on offshore cays, though no evidence has been obtained.

Bonaparte's Gull (*Larus philadelphia*) is a rare winter visitor. Several birds at Double Bay, 22 January to 5 February 1977 constitute the only definite record for Eleuthera. Previously reported only as a vagrant after storms in the Bahamas (Brudenell-Bruce 1975).

Ring-billed Gull (*Larus delawarensis*) is a scarce winter resident with a maximum of 4 seen per day, invariably sub-adults, from 18 October to 20 March. Generally found in the big pond NW of Palmetto Point Intersection along the Queen's Highway.

Herring Gull (*Larus argentatus*) is a scarce winter resident with a maximum of four seen in one day, invariably 1st and 2nd year birds. From 21 August to 1 May it can generally be found in the big pond NW of the Palmetto Point intersection along the Queen's Highway.

Gull-billed Tern (*Sterna nilotica*) is a common summer resident, from 10 April to 12 November. Though no nest was found, birds were observed in courtship display and copulation. Young birds were also seen in late summer begging for food.

Royal Tern (*Sterna maxima*) is a common permanent resident. A group of 30-40 birds can usually be found in the large pond NW of the Palmetto Point Intersection.

Sandwich Tern (*Sterna sandvicensis*) is a common summer and uncommon winter resident. No nesting colonies were found but Connor often saw young birds that may have been reared locally begging food from adults.

Roseate Tern (*Sterna dougallii*) is an uncommon permanent resident. A colony of c. 30 pairs nests on the cays north of Pelican Cay, near Governor's Harbour Airport.

Common Tern (*Sterna hirundo*) is an uncommon winter resident, from 22 July to 22 April. Occasionally found with Roseate Terns in late summer. There are no other records for Eleuthera, but most authorities have assumed that this species occurs on the island from time to time.

Forster's Tern (*Sterna forsteri*) is a rare winter visitor. From one to four birds seen on several occasions at Double Bay, 22 January to 5 February and 19 September 1977. These are the only Eleuthera records. Previously recorded in the Bahamas only from Exuma, 21 November 1954 (Brudenell-Bruce 1975).

Least Tern (*Sterna antillarum*) is a common summer resident from 16 April to 18 September. It nests throughout the island on pebbly surfaces near ponds.

Bridled Tern (*Sterna anaethetus*) is a common summer resident from 6 May to 11 September. Small colonies of up to 12 pairs nest on small cays offshore and on the mainland near the Navy pier at Receiver's Beach.

Sooty Tern (*Sterna fuscata*) is a common summer resident from 20 April to 23 September. Up to 1000 pairs nest on Gut Island and another 25 pairs or so on Diamond Key, both off Double Bay. They also nest on the Schooner Cays off Powell Point.

Black Tern (*Chlidonias niger*) is a common fall migrant from 22 July to 16 September. It is found primarily over ponds between James Cistern and Governor's Harbour Airport, where up to 18 have been seen in one day. There is only one previous published record for Eleuthera, a bird captured 17 October 1956 by Maurice Collett (Bond, 2nd Supplement, 1957).

Brown Noddy (*Anous stolidus*) is a common summer resident from 24 April to 11 September. As many as 40 have been observed on Gut Island, where it may nest. Though no nest was found, immature birds were observed along with adults on this island.

Rock Dove (*Columba livia*) is an introduced species with a few pairs in every small town, with up to a dozen birds in Hatchet Bay.

White-crowned Pigeon (*Columba leucocephala*) is a common permanent resident, more abundant in summer. It can normally be seen in the evenings flying from the main island to the cays off the Western shore where it nests.

Zenaida Dove (*Zenaida aurita*) is a locally common permanent resident. It is easily located in the vicinity of Ten Bay Beach where young have been observed, though no nest was located.

Mourning Dove (*Zenaida macroura*) is a common permanent resident. It is found throughout the island, but is more abundant in the vicinity of farms and dairies, especially those around Hatchet Bay. Nests may be found anywhere.

Common Ground-Dove (*Columbina passerina*) is a common permanent resident, nesting throughout the island.

Key West Quail-Dove (*Geotrygon chrysia*) is an uncommon permanent resident whose secretive habits make it difficult to find. It frequents fruit trees where it feeds on fallen fruits, especially sapodilla.

Yellow-billed Cuckoo (*Coccyzus americanus*) is a fall and spring transient, common in some years, and scarce or absent in others; 23 to 30 April and 1 August to 19 November. Can show up anywhere.

Mangrove Cuckoo (*Coccyzus minor*) is a common permanent resident frequenting dense scrub from which it can be heard calling in the evenings anywhere on the island.

Great Lizard Cuckoo (*Saurothera merlini*) is an uncommon permanent resident frequenting dense scrub throughout the island. The tall scrub at Ten Bay and SE of North Palmetto Point along the Old Queen's Highway are good places to look for this species.

Smooth-billed Ani (*Crotophaga ani*) is a common permanent resident found throughout the island on roadsides and in fields. Groups of 6 to 14 are often seen.

Common Barn-Owl (*Tyto alba*) is an uncommon permanent resident. It nests in caves in cliffs on the western side of the island and on small cays offshore which have small caves in their clifflike faces.

Burrowing Owl (*Athene cunicularia*) is a common permanent resident. A colony is located on Whale Point just NW of the Glass Window.

Common Nighthawk (*Chordeiles minor*) is an uncommon spring migrant from 28 April to 21 May. This species probably transits the island in fall as well, but can only be separated from the Antillean Nighthawk (*C. gundlachii*) when its nasal "peent" call can be heard. It is found throughout the island.

Antillean Nighthawk (*Chordeiles gundlachii*) is a common summer resident from 23 April to 1 October. It can be separated from the Common Nighthawk (*C. minor*) by its "pity-pit-pit" call in the spring. It nests throughout the island on bare areas and on beaches near the base of sand dunes. It is hard to miss in the evenings when it is hawking for insects overhead.

Chuck-will's-widow (*Caprimulgus carolinensis*) is a rare winter visitor. A single bird stayed from 26 December 1977 to 1 January 1978 in the stand of trees at the North end of French Leave (Club Med) Beach. This is the only record for Eleuthera.

Chimney Swift (*Chaetura pelagica*) is a fall and spring transient from 16 September to 26 October and 27 April to 5 May, with one summer record, 13 June 1976 at Governor's Harbor. Of interest is an observation of 1000 + birds 2 May 1979 over North Palmetto Point Ball Field.

Bahama Woodstar (*Calliphlox evelynae*) is a common permanent breeding resident. It is found throughout the island in gardens and at flowering agave stalks.

Belted Kingfisher (*Ceryle alcyon*) is an uncommon winter resident from 5 July to 7 May. It is found around ponds throughout the island.

Yellow-bellied Sapsucker (*Sphyrapicus varius*) is an uncommon winter resident from 23 September to 28 April. It is found in larger trees throughout the island, especially those at the NE end of North Palmetto Point near the Reed Pond.

Eastern Wood-Pewee (*Contopus virens*) is an uncommon fall and scarce spring transient; 18 September to 12 November and 28 March. It may show up anywhere on the island.

Greater Antillean Pewee (*Contopus caribaeus*) is an uncommon summer and scarce winter resident. It can be found in the casuarina and coconut palms at the north end of North Palmetto Point from 21 May to mid-August.

Yellow-bellied Flycatcher (*Empidonax flaviventris*) is an accidental. One record from South Palmetto Point, 3 October 1976. This is the first Bahamian record, the only other West Indian records are from Cuba (Bond 1974).

Acadian Flycatcher (*Empidonax virescens*) is a rare fall transient. One 11 September 1972 in a small citrus grove SE of North Palmetto Point along the Old Queen's Highway. There are no other records for Eleuthera.

Eastern Phoebe (*Sayornis phoebe*) is a rare winter visitor. The one seen 20 January 1972 at the U. S. Naval Facility is the only record for Eleuthera. The only other Bahamian records are from Bimini and Grand Bahama (Bond 1974, and Brudenell-Bruce 1975).

LaSagra's Flycatcher (*Myiarchus sagrae*) is an uncommon summer resident from 27 March to 25 September. It nests in tree cavities at Palmetto Point and Ten Bay.

Western Kingbird (*Tyrannus verticalis*) is a rare fall transient. Two records, 23 October 1977 and 11 November 1972. Both were in the casuarinas on the U. S. Naval Facility.

Eastern Kingbird (*Tyrannus tyrannus*) is a common fall migrant from 23 August to 10 November. Seen throughout the island, but of special interest was a large group of 600 + birds which appeared at the U. S. Naval Facility 23 October 1977.

Gray Kingbird (*Tyrannus dominicensis*) is a common summer resident from 3 April to 18 November. It nest throughout the island, and is easily found in the vicinity of tall casuarina trees.

Purple Martin (*Progne subis*) is an uncommon fall and spring migrant from 20 to 27 August and 4 March to 1 May. It is seen flying over open areas throughout the island.

Cuban Martin (*Progne cryptoleuca*) is a rare spring visitor. One bird on 4 March 1978 along with *P. subis* over a shallow pond near Receiver's Beach, just SE of Governor's Harbour airport. Both species rested on power lines giving a good opportunity to study and compare them. There are no records for the Bahamas, but since many authorities consider this form conspecific with *P. subis*, the two are not always distinguished in published statements.

Tree Swallow (*Tachycineta bicolor*) is a scarce fall transient from 28 August to 24 November. It is found over open fields and ponds along with Barn Swallows (*Hirundo rustica*), especially near Hatchet Bay.

Bahama Swallow (*Tachycineta cyaneoviridis*) is a scarce summer visitor which appears only after heavy rains; 8 June to 12 August. No evidence of breeding was found. May show up anywhere on the island, usually perched on power lines.

Bank Swallow (*Riparia riparia*) is a rare fall and spring transient for which we have two records, 7 October 1978 and 10 May 1976. To be looked for in groups of Barn and Tree Swallows, especially over ponds.

Barn Swallow (*Hirundo rustica*) is a common fall and uncommon spring transient, from 19 August to 19 November and 5 April to 20 May. The most common swallow by far, found over open fields and small ponds, especially around Hatchet Bay.

Northern Wheatear (*Oenanthe oenanthe*) is an accidental. Connor saw one on 1 October 1976 sitting on a large rock and on cement blocks which held a water pipe above ground on the road to Receiver's Beach. Its upright stance, buff color, white rump and inverted black "T" on the tail made the bird unmistakable. This sighting was mentioned in *American Birds*, 31:229 (Finch 1977). There are three records for this species from the West Indies (Cuba, Puerto Rico, Barbados), but this is the first record for the Bahamas.

Bluebird sp. (*Sialia currucoides*?) is an accidental. One record: 24 and 25 November 1976, after several days of high winds from the west. When Connor first saw the bird, he identified it as an Eastern Bluebird (*Sialia sialis*) but in retrospect, the shade of blue on the bird seemed too light and pastel. He returned and studied the bird intensively, using several field guides, and satisfied himself that the shade of blue and brown color (not rust) on this individual indicated a female Mountain Bluebird. The bird was photographed, but the weather was rainy and conditions were not good for photography. When the weather cleared, the bird disappeared. There is no other record for the West Indies.

Veery (*Catharus fuscescens*) is a rare fall transient. Two on 3 October 1976 at the far end of the second pond SE of North Palmetto Point. This is the only record for Eleuthera.

Swainson's Thrush (*Catharus ustulatus*) is a rare fall migrant from 3 to 20 October. Found primarily in the area north of and SE along the Old Queen's Highway from North Palmetto Point and on the U. S. Naval Facility. There are no other records for Eleuthera.

American Robin (*Turdus migratorius*) is a rare winter visitor. Two records, 24 December 1977 and 25 January 1977, one at Spanish Main Resort and the other in the northern part of North Palmetto Point.

Red-legged Thrush (*Turdus plumbeus*) is a common permanent resident. It can be found nesting throughout the island, primarily in dense moist places with a few coconut palms.

Gray Catbird (*Dumetella carolinensis*) is a common winter resident from 5 October to 11 May. Found throughout the island.

Northern Mockingbird (*Mimus polyglottos*) is a common permanent resident found throughout the island. It nests primarily in and around towns.

Bahama Mockingbird (*Mimus gundlachii*) is a common permanent resident found throughout the island. In contrast to the Northern Mockingbird, this species nests primarily in scrub away from human habitations.

Sprague's Pipit (*Anthus spragueii*) is an accidental. One on 21 September 1971 on the U. S. Naval Facility. This is the first record for Eleuthera. There are three other records for the Bahamas, two from Grand Bahama, 19-23 October 1966 (Brudenell-Bruce 1975) and 20-21 October (Bond 1974), and Andros Island 13 April (Bond 1974).

European Starling (*Sturnus vulgaris*) is a scarce fall visitor that appears to be becoming a yearly regular. Some typical sightings include: twelve at the U. S. Naval Facility on 29 October 1976; thirty in a field and on power lines near James Cistern on 30 October 1976, eight near James Cistern on 15 November 1977, two at the Naval Facility on 28 October 1978.

White-eyed Vireo (*Vireo griseus*) is an uncommon winter resident from 3 October to 2 April. Found throughout the island in brush.

Thick-billed Vireo (*Vireo crassirostris*) is a common permanent resident found throughout the island nesting in scrub and thickets.

Yellow-throated Vireo (*Vireo flavifrons*) is a scarce winter resident from 29 September to 5 March. It is found primarily north of Governor's Harbour near a small pond NE of the water tank at the top of the hill, and in the scrub north of North Palmetto Point.

Philadelphia Vireo (*Vireo philadelphicus*) is a rare fall transient for which we have one record, 29 September 1976. Noted in the wooded area north of North Palmetto Point. Both Bond (1974) and Brudenell-Bruce (1975) reported this species from Eleuthera.

Red-eyed Vireo (*Vireo olivaceus*) is an uncommon fall migrant from 16 September to 31 October. Found throughout the island.

Black-whiskered Vireo (*Vireo altiloquus*) is a common summer resident from 16 April to 16 October. Nests throughout the island.

Blue-winged Warbler (*Vermivora pinus*) is a rare fall transient for which we have three records, 18 September 1976, 11 October 1976 and 17 December 1978. These are the only records for Eleuthera. Found in the woods north of North Palmetto Point.

Golden-winged Warbler (*Vermivora chrysoptera*) is a rare fall transient for which we have one record, 27 September 1978. Found approximately 2 miles NE of Balera Bay along the Atlantic Coast.

Tennessee Warbler (*Vermivora peregrina*) is an uncommon fall transient from 12 September to 18 November. Found primarily in the casuarinas behind Governor's Harbor airport.

Orange-crowned Warbler (*Vermivora celata*) is an uncommon winter resident from 29 September to 13 May. Found throughout the island in low scrub, but easily overlooked due to its habit of staying under cover and low to the ground.

Nashville Warbler (*Vermivora ruficapilla*) is a scarce fall migrant from 18 September to 31 October. Found primarily in stands of casuarinas near water, especially behind Govenor's Harbor airport.

Northern Parula (*Parula americana*) is a common winter resident from 25 August to 28 April. Found throughout the island.

Yellow Warbler (*Dendroica petechia*) is a scarce fall migrant from 17 August to 4 November. Found primarily in the area near the second pond SE of North Palmetto Point along the Old Queen's Highway. There is an old record of *D. p. gundlachi* collected on 12 March 1891 (Ridgway, 1891). This form is widespread as a breeding bird in the Bahamas and probably once bred on Eleuthera, but Connor did not find it in 5 years of field work. Extensive cutting and farming may have extirpated the taxon on the island.

Chestnut-sided Warbler (*Dendroica pensylvanica*) is a scarce fall migrant for which there is one record, 20 September 1978, an immature bird at the SE end of the Reed Pond at North Palmetto Point. This is the only record for Eleuthera.

Magnolia Warbler (*Dendroica magnolia*) is an uncommon winter resident from 1 October to 9 April. Found throughout the island.

Cape May Warbler (*Dendroica tigrina*) is a common winter resident from 28 August to 2 May. Found throughout the island.

Black-throated Blue Warbler (*Dendroica caerulescens*) is a common winter resident from 18 September to 25 April. Easily found in the wooded area and near the Reed Pond at North Palmetto Point.

Yellow-rumped Warbler (*Dendroica coronata*) is a common winter resident from 17 October to 2 April. The second most abundant warbler on the island and found throughout.

Black-throated Green Warbler (*Dendroica virens*) is a scarce transient and winter resident from 5 October to 9 April. Found in the area SE of North Palmetto Point in trees around the Reed Pond.

Blackburnian Warbler (*Dendroica fusca*) is a rare fall transient for which we have one record, 22 October 1977. Seen in the casuarinas behind Governor's Harbor airport.

Yellow-throated Warbler (*Dendroica dominica*) is a common winter resident from 20 July to 4 April. Found throughout the island primarily in stands of larger trees.

Pine Warbler (*Dendroica pinus*) is a rare visitor. One 16 to 22 October 1972 in the casuarinas north of North Palmetto Point. Though recorded from Harbour Island, a stone's throw off North Eleuthera, this is the only record for Eleuthera. The scarcity of this species is due to the fact that there are no natural pines on Eleuthera.

Prairie Warbler (*Dendroica discolor*) is a common winter resident from 30 July to 12 April. Found throughout the island.

Palm Warbler (*Dendroica palmarum*) is a common winter resident from 17 September to 3 May. The most abundant warbler on the island and found throughout.

Bay-breasted Warbler (*Dendroica castanea*) is a rare transient. We have two records, 3 October 1976 and 4 October 1977. Both sightings were in the stands of casuarinas behind Governor's Harbor airport.

Blackpoll Warbler (*Dendroica striata*) is an uncommon fall and spring transient, 22 September to 26 October and 22 April to 3 May. Noted primarily on the U. S. Naval Facility, but found throughout the island.

Black-and-white Warbler (*Mniotilta varia*) is a common winter resident from 1 August to 14 May. Found throughout the island.

American Redstart (*Setophaga ruticilla*) is a common winter resident from 25 August to 25 May. Found throughout the island.

Prothonotary Warbler (*Protonotaria citrea*) is an uncommon fall and spring transient from 4 August to 13 October, and 3 April to 5 May. Found throughout the island primarily near ponds.

Worm-eating Warbler (*Helmitheros vermivorus*) is a scarce winter resident from 19 September to 25 April. Found primarily in the area around the Reed Pond SE of North Palmetto Point.

Swainson's Warbler (*Limnothlypis swainsonii*) is a scarce spring transient for which we have two records; 5 March 1979, SE of Gregory Town in the development at Surfer's Beach, and 6 May 1972 at South Palmetto Point. This species may be more plentiful than indicated, but overlooked due to its habit of foraging on the ground in dense cover.

Ovenbird (*Seiurus aurocapillus*) is a common winter resident from 22 August to 8 May. Found throughout the island, but primarily in damp, heavily vegetated areas.

Northern Waterthrush (*Seiurus noveboracensis*) is a common winter resident from 27 August to 8 May. Both races occur and are found primarily in damp areas, especially around the ponds between North Palmetto Point and Double Bay.

Louisiana Waterthrush (*Seiurus motacilla*) is an uncommon winter resident from 17 July to 3 April. Found primarily around the Reed Pond at North Palmetto Point.

Mourning Warbler (*Oporornis philadelphia*) is a rare fall transient for which we have one record, 9 November 1978. Seen at the edge of the woods at the North End of North Palmetto Point. This is the first record for Eleuthera.

Common Yellowthroat (*Geothlypis trichas*) is a common winter resident from 9 September to 30 April. Found throughout the island.

Bahama Yellowthroat (*Geoghlypis rostrata*) is an uncommon permanent resident at the Northern part of the island, but scarce in other parts. It can often be found in fields and pastures around Hatchet Bay. Easily confused with the Common Yellowthroat, which is much more common in winter but absent in summer.

Hooded Warbler (*Wilsonia citrina*) is a scarce fall and spring transient from 20 September to 31 October, and 25 April 1977. Noted in the woods north of North Palmetto Point.

Wilson's Warbler (*Wilsonia pusilla*) is a rare spring transient for which we have one record, 28 March 1976 near the Reed Pond at North Palmetto Point. This is the only record for Eleuthera.

Yellow-breasted Chat (*Icteria virens*) is a rare fall transient, seen 20 October 1977 near the top of the hill at Governor's Harbor. This is the only record for Eleuthera.

Bananaquit (*Coereba flaveola*) is a common permanent resident found throughout the island.

Stripe-headed Tanager (*Spindalis zena*) is an uncommon permanent resident found throughout the island.

Summer Tanager (*Piranga rubra*) is a rare fall transient for which we have two records, 10 October 1976, and 22 October 1977. Both seen in the stands of casuarinas behind Governor's Harbor airport. These are the only records for Eleuthera.

Scarlet Tanager (*Piranga olivacea*) is a rare spring transient. The bird seen on 22 April 1979 at Spanish Main Resort is the second record for the Island. The other is a bird seen by Maurice Collett on 10 April 1956 (Bond, 2nd Supplement, 1957).

Rose-breasted Grosbeak (*Pheucticus ludovicianus*) is a scarce fall and spring transient from 6 October to 23 October and 4 May. May show up anywhere on the island.

Blue Grosbeak (*Guiraca caerulea*) is a rare fall and common spring transient from 16 September to 5 November and 18 April to 3 May. Found in fairly open areas with tall grass throughout the island.

Indigo Bunting (*Passerina cyanea*) is a common winter resident from 18 September to 28 April. Found throughout the island.

Painted Bunting (*Passerina ciris*) is a scarce winter resident from 18 November to 26 March. Found with the Indigo Bunting, especially near the Reed Pond at North Palmetto Point.

Chipping Sparrow (*Spizella passerina*) is a scarce fall and winter visitor from 21 October to 31 December. Found primarily on the U. S. Naval Facility and the area behind Governor's Harbor airport. There is no previous record for Eleuthera, but the species has been noted on Harbour Island in late November 1967 by C. R. Mason and others on a Florida Audubon expedition (Bond, 13th Supplement, 1968).

Clay-colored Sparrow (*Spizella pallida*) is an accidental. One record, 26 October 1977. The bird was with Chipping Sparrows on the U. S. Naval Facility. This is the first record for Eleuthera.

Lark Sparrow (*Chondestes grammacus*) is a rare fall visitor. We have two records, 29 September and 3 October 1976. Both birds were immatures in the vicinity of the fourth pond SE of North Palmetto Point along the Old Queen's Highway. These are the only records for Eleuthera, if indeed two individuals were involved. Both records could easily be the same bird seen twice.

Savannah Sparrow (*Passerculus sandwichensis*) is a common winter resident from 30 October to 15 April. Found primarily in the area behind Governor's Harbor airport.

Grasshopper Sparrow (*Ammodramus savannarum*) is a scarce winter resident from 9 November to 11 March. Found primarily in the grassy area between the ballfield and the Reed Pond at North Palmetto Point.

Henslow's Sparrow (*Ammodramus henslowii*) is an accidental. Connor saw one on 29 September 1972. The bird had a heavy bill, dark crown stripes, clearly visible eye ring, streaking on the chest, an olive colored head and nape and rusty wings. Connor saw it in the grassy areas of North Palmetto Point ballfield. This is the first record for the Bahamas and the only one for the West Indies.

Song Sparrow (*Melospiza melodia*) is a scarce winter resident from 2 October to 17 April. Found primarily in the area behind Governor's Harbor airport and on the U. S. Naval Facility. These are the only observations for Eleuthera.

Lincoln's Sparrow (*Melospiza lincolnii*) is a rare fall and spring transient for which we have four records: 4 November, 12 and 20 March 1977, and 14 March 1978. Seen perched on exposed branches overhanging and in the reeds of the Reed Pond at North Palmetto Point. The species has been seen only once before on Eleuthera, on 26 November 1964 by Margaret Hundley and others on a Florida Audubon trip, (Bond, 10th Supplement, 1965). It has also been reported from Harbour Island in late November 1967 by C. R. Mason et. al. on an Audubon trip (Bond, 13th Supplement, 1968).

White-crowned Sparrow (*Zonotrichia leucophrys*) is a scarce fall visitor for which we have two records, 17 and 31 October 1976. Both were immmature birds, one seen on the U. S. Naval Facility and the other just past the fourth pond in a small grassy area SE of North Palmetto Point along the Old Queen's Highway. There may have been only one bird seen twice. These sightings are the only records for Eleuthera.

Bobolink (*Dolichonyx oryzivorus*) is a scarce fall and spring transient from 10 to 29 September and 20 April to 14 May. Found in tall grassy areas throughout the island.

Red-winged Blackbird (*Agelaius phoeniceus*) is a rare resident for which we have one record, 27 May 1978. A singing male at the extreme end of Whale Point.

Brown-headed Cowbird (*Molothrus ater*) is a rare spring visitor. The two females seen on 28 May 1977 were on the U. S. Naval Facility. This is the only record for Eleuthera.

Northern Oriole (*Icterus galbula*) is an uncommon fall and rare spring transient from 11 September to 12 November and 3 May 1976. Found throughout the island and noted eating seagrapes.

Black-faced Grassquit (*Tiaris bicolor*) is a common permanent resident found throughout the island.

Greater Antillean Bullfinch (*Loxigilla violacea*) is a common permanent resident found throughout the island.

Discussion

We report herein, records of 205 species seen on the island of Eleuthera by Harold Connor. Thirty-one of these are new for Eleuthera; nine are new for the Bahamas; and three are new for the West Indies. New for Eleuthera are: Olivaceous Cormorant, White Ibis, Greater Flamingo, Fulvous and West Indian Whistling-Duck, Northern Pintail, Gadwall, Redhead, Greater Scaup, Red-breasted Merganser, Whimbrel, Dunlin, Bonaparte's Gull, Common Tern, Forster's Tern, Acadian Flycatcher, Eastern Phoebe, Veery, Swainson's Thrush, Sprague's Pipit, Blue-winged, Chestnut-sided, Mourning, and Wilson's Warblers, Yellow-breasted Chat, Summer Tanager, Clay-colored, Lark, Song and White-crowned Sparrows and Brown-headed Cowbird. New for the Bahamas

are: Canada Goose, Canvasback, Bufflehead, Swallow-tailed Kite, Virginia Rail, Baird's Sandpiper, Yellow-bellied Flycatcher, Cuban Martin and Northern Wheatear (previously published). New to the West Indies are Eurasian Curlew, Mountain Bluebird, and Henslow's Sparrow. In addition, we suggest changes in the known status of several other species, e.g., Green-winged Teal, Hooded Merganser, Limpkin, Red Knot. We also report the first evidence for the breeding of the Ruddy Duck on Eleuthera. We did not see 17 species previously reported on Eleuthera (Table 1). The many revisions that are needed in our understanding of the status of the birds of Eleuthera are largely the result of the fact that relatively little concentrated observation has been done there when compared with, say, New Providence. We hope that this paper improves our understanding of the birds of Eleuthera, the Bahamas and the West Indies and provides a baseline for further research.

Table 1. Species previously reported for Eleuthera, not located in this study (includes Harbour Island).

Species		Reference
Reddish Egret	*Egretta rufescens*	Bond, Supp. 11, 1966.
Mallard	*Anas platyrhynchos*	Schwartz and Klinikowski 1965.
Red-tailed Hawk	*Buteo jamaicensis*	Bond, Supp. 2 1957.
Chukar	*Alectoris chukar*	Bond, Supp. 20 1976.
Black Rail	*Laterallus jamaicensis*	Bond 1956.
Purple Gallinule	*Porphyrula martinica*	Bond, Supp. 2 1957.
Hudsonian Godwit	*Limosa haemastica*	Schwartz and Klinikowski 1965.
Great-crested Flycatcher	*Myiarchus crinitus*	Bond, Supp. 2 1957.
Hermit Thrush	*Catharus guttatus*	Bond, Supp. 19 1974.
Pearly-eyed Thrasher	*Margarops fuscatus*	Bond, Supp. 9 1964. Bond, Supp. 22 1978.
Brown Thrasher	*Toxostoma rufum*	Bond, Supp. 11 1966.
Cedar Waxwing	*Bombycilla cedrorum*	Bond, Supp. 2 1957.
House Wren	*Troglodytes aedon*	Bond, Supp. 14 1969.
Ruby-crowned Kinglet	*Regulus calendula*	Bond, Supp. 14 1969.
Blue-grey Gnatcatcher	*Polioptila caerulea*	Bond, Supp. 7 1962.
Solitary Vireo	*Vireo solitarius*	Bond 1956.
Kirtland's Warbler	*Dendroica kirtlandii*	Bond, Supp. 2 1957.

Acknowledgments

We thank Don Buden, James Rodgers, James A. Kushlan and Paul Sykes for helpful comments on the manuscript.

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EDITORIAL

Acknowledgments.—I thank everyone who has contributed to the publication of volume 13 of the Florida Field Naturalist. I especially acknowledge our reviewers, whose advice is essential to our evaluation process: Chris Belden, John Bengtson, Donald Buden, Michael Callopy, Steven P. Christman, Robert L. Crawford, Joan Diemer, Robert Duncan, Jack Ewel, Shiela Gaby, Wally George, Jack Hailman, J. William Hardy, David Hirth, Wayne Hoffman, Lawrence Kilham, H. P. Langridge, James Layne, Peter Merritt, Henry Mushinsky, Stephen Nesbitt, Oscar T. Owre, Peggy Powell, Galen Rathbun, William Robertson, James A. Rodgers, Henry M. Stevenson, Robert Storer, Milton Weller, Lovett Williams, Charles Wood, and Glen E. Woolfenden. I thank my associate editors, James A. Rodgers, H. P. Langridge, and Oscar T. Owre for their initiatives. I am greatfull for the support of the former and present officers, especially Barbara Kittleson and Caroline Coleman, and my trusted advisors, Glen Woolfenden, Fred Lohrer, and Jack Hailman.—**James A. Kushlan,** Department of Biological Sciences, East Texas State University, Commerce Texas 75428.

Florida Field Naturalist 13: 93.

NOTES

American Crows provoking reactions from Wild Turkeys and Red-shouldered Hawks.—Provoking other birds or mammals to react in some way or give chase, is a behavior that has been little described for American Crows (*Corvus brachyrhynchos*) other than accounts by Smyth (1960) of their stooping on American Kestrels (*Falco sparverius*), by Erskine (1968) of a crow chivving a Bald Eagle (*Haliaeetus leococephalus*) and by Kilham (1982) of crows pulling the tails of river otter (*Lutra canadensis*). I here report American Crows provoking Wild Turkeys (*Meleagris gallopavo*) and a Red-shouldered Hawk (*Buteo lineatus*) at the Hendrie ranch, 25 km south of Lake Placid, Highlands County, Florida, in January-May 1983-85. The tameness of the crows, maintained by a daily feeding of corn, enabled me to distinguish yearling from adult crows, using the criteria of Emlen (1936). Other behaviors of American Crows in Florida are described elsewhere (Kilham 1984a and b).

When I scattered corn, hen Wild Turkeys came almost as often as crows, the two species often feeding together. In 1984 the turkeys appeared more aggressive than in previous years, chasing each other as well as driving the crows away. After some weeks the crows ceased coming to the corn. I then noticed a few crows behaving as if they were trying to entice the turkeys to chase them. This appeared easy due to a habit of the turkeys of running to almost any crow active on the ground, as though crows indicated the presence of corn, whether corn was there or not. On 2 February 1984, an adult crow was Bowing (Kilham 1985) by itself on a pasture when a turkey ran toward it. The crow picked up some debris and hopped away, picking up and dropping several more items as the turkey followed. When the turkey came close, the crow jumped to a snag, still holding debris. When the turkey walked away, the crow walked after it, pecking the ground. The turkey then turned and ran at the crow with wings out and tail elevated. The crow, spreading it wings, faced the turkey momentarily, then retreated. Interaction between the two went on for 7 min. In an interlude the crow flew to a fence post with the turkey following to the foot of it. The two then returned to where they had started, with the crow swooping at the turkey as it ran. A crow was working on a cow pie on the following morning when a turkey ran to it. The crow, taking a section of cow pie in its bill, moved away with the turkey in pursuit. The interactions that followed were much the same as on 2 February.

On 28 January 1985, I observed a lone yearling crow making varied low caws, when, still vocalizing, it flew to within 3 m of a Red-shouldered Hawk perched at mid-tree level in a swamp. The hawk flew at the crow and the crow retreated, but when the hawk perched, the crow, vocalizing as before, approached again. The hawk chased the crow three times in 4 min, each time for 3-4 m among branches of a red maple (*Acer rubra*). Other members of the yearling's group, foraging in the swamp, paid little attention to the interplay of hawk and yearling 10-15 m away. I witnessed a similar interaction between a Red-shouldered and a crow in the same maple on 27 January, but in less detail.

Provoking attacks have been reported for other *Corvus* species. A memorable account is Schaller's (1964) observation of gorillas (*Gorilla gorilla*) that ducked when a pair of White-necked Ravens (*C. albicollis*) flew over. The ravens, returning, swooped on the gorillas repeatedly, making the gorillas "angrier" than Schaller had previously seen them. Fossey (1983) observed much the same situation 20 years later when a large male sat rigid as a pair of ravens dive-bombed its head. Mech (1970) describes Common Ravens (*C. corax*) swooping on wolves (*Canis lupus*) and the wolves leaping at the ravens. Among other

corvids Blue Jays (*Cyanocitta cristata*) are described in Bent (1946) as repeatedly flying into the face of a Sharp-shinned Hawk (*Accipiter velox*) and being chased, a behavior that I have also noted (unpubl. obs.). Provoking a larger or more powerful animal would seem to occur among a variety of corvids when another animal responds. The function of this behavior is unclear and worthy of additional study.

I thank James H. Hendrie, Sr., and John D. Hendrie for letting my wife and I visit their ranch, my wife Jane for aid in making observations, and James N. Layne and Fred Lohrer of the Archbold Biological Station, Lake Placid, Florida, for help of various kinds.

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Florida Field Naturalist 13: 94-95.

Gray squirrel kills and eats Blue Jay fledgling.—On 27 May 1978 at Athens, Georgia, we observed a gray squirrel (*Sciurus carolinensis*) capture and eat a fledgling blue jay (*Cyanocitta cristata*). Four fledglings were observed attempting to fly. Three were relatively inactive: the fourth flapped its wings while climbing an oak tree trunk. Four to six adult-sized gray squirrels were nearby. One stalked the active fledgling. Twice when the squirrel approached the fledgling, two adult jays flew near the squirrel thereby diverting its attention.

After 20 to 30 min., the squirrel suddenly lunged and captured the jay with its mouth. Two adult jays attacked the squirrel with swoops and pecks and gave repeated distress calls. These calls were intense, high-pitched, rapid screams (one every 1 to 2 sec) similar in sound to "jeeah". The squirrel ran onto a nearby tree with the fledgling in its mouth.

Following the calls, 10 to 12 adult jays arrived and began to mob the squirrel. We approached the tree and observed the squirrel eating the fledgling. It rotated the dead bird with its front paws while alternately chewing the bird's head, wings, feet, and bill. Most of the mobbing jays soon left, but the two adults originally present remained and occasionally gave distress calls.

Twenty minutes later, the adults tended the remaining young much as before the squirrel attack and continued to do so for 30 min more. The adults repeatedly flew from branch to branch, or ground to branch within 10 m of the fledglings. During this period, fewer

squirrels were observed in the area and the remaining fledglings were more dispersed, perhaps a result of our proximity or of the earlier mobbing behavior of the jays.

Although general accounts of gray squirrel feeding habits list animal foods, including small birds and eggs, as a small dietary component (e.g. Brown and Yeager 1945, Jennings 1951, Martin et al. 1961, Nixon et al. 1968, Walker 1975), we could find no documentation of prey capture. Jennings (1951) reported an observation of a gray squirrel "in the process of eating a freshly killed Palm Warbler (*Dendroica palmarium*) which it handled as if the bird had been a large nut, turning it over repeatedly and plucking feathers off." The observer did not see how the squirrel obtained the bird. The description of the handling of the bird, however, is similar to our observation.

Animal foods in the diet of gray squirrels in late May have been reported before. Nixon (1970) observed three juvenile gray squirrels feeding on bark-dwelling insects in late May. He also found more insects in squirrel stomachs in late spring and summer and more insects in juvenile stomachs than in adults. He attributed these results to a shortage of forest seed crops, the high protein content of insects, and the abundance of recently weaned squirrels at this time of year. Although we have no population estimates of gray squirrels in Athens, it is possible that food shortage, dense populations, and the availability of easy prey account for the predatory behavior of the gray squirrel we observed.

We wish to thank J. R. Tamsitt and especially W. B. McGillvray for critical comments on an earlier draft. Stephen R. Humphrey of the Florida State Museum provided helpful suggestions and encouragement.

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Florida Field Naturalist 13: 95-96.

A clutch of five-lined skink eggs from south Florida.—Little has been published on the reproductive biology of *Eumeces inexpectatus*, the southeastern five-lined skink. In this note, I report on the largest clutch size and latest hatching date recorded for this species.

On the morning of 26 October 1983, a female skink was discovered with a clutch of 14 eggs under a limestone rock in sandy soil at the United States Department of Agriculture Subtropical Research Station, Miami (Dade Co.), Florida. When first uncovered the female was curled in a semicircle around her eggs, in brooding posture as has been reported for *Eumeces fasciatus* (Fitch 1954). The rock was carefully placed back over the nest and in the afternoon of the same day, I collected the skink in attendance and the eggs, two of

which had begun to hatch. The female made no attempt to defend her eggs on either occasion. The adult died within a few days, and examination of the gonads verified the sex as female. The median size (ranges) of 10 normal-appearing eggs (two were partially collapsed, see below) was 13.9 mm (12.3-14.5 mm) for length, 10.4 mm (9.1-12.4 mm) for width, and median weight was 0.7 g (0.6-1.0 g). The female measured 73 mm snout-vent length (SVL) with a tail length of 122 mm (95 mm regenerated portion). All 14 eggs hatched within 72 hours after discovery. Median hatchling size was 25.0 mm (24.0-26.0 mm) SVL, and 36.0 mm (34.0-37.0 mm) tail length.

Previous nesting dates for this species have been reported on 23 June and 28 August in Florida (Duellman and Schwartz 1958, Hamilton 1958), and the only hatching date recorded is 14 August in Mississippi (Smith and List 1955). Previous clutch sizes include the following: Alabama, 6 and 8 (Mount 1975); Florida 11 and 11 (Duellman and Schwartz 1958; Hamilton 1958); Mississippi, 11 (Smith and List 1955). Three dissected females from Kentucky averaged 11 undeveloped ova (Rundquist and Collins 1974). Egg sizes reported here are similar to those reported by Duellman and Schwartz (1958) and by Hamilton (1958). My hatchling sizes were similar to those reported by Conant (1975) and Duellman and Schwartz (1958).

Two eggs appeared partially collapsed, but all eggs hatched apparently normal young. During drought years Fitch (1954) reported collapsed eggs from *E. fasciatus* which also hatched successfully. Rainfall for September and October 1983 in Miami was below normal with only 80% of the average precipitation of 39.7 cm (N.O.A.A. 1983). Climatic variation within the nest microhabitat may have caused partial collapse of some eggs.

In summary, only scant information is available on the reproductive biology of *E. inexpectatus*. This note summarizes previous published data and includes an additional report of the largest clutch size of 14 eggs and latest hatching date of 28 October for this species.

I thank George H. Dalrymple for comments on this manuscript, and Ginny Wheeler for securing many inter-library loan requests.

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Least and Roseate tern nesting sites in the Florida Keys.—The status of the Least Tern (*Sterns albifrons*) and the Roseate Tern (*Sterna dougallii*) have been matters of concern for a number of years (Fisk 1978a, Robertson 1978). The Least Tern nests on bare sand, usually along unstable beaches or on sandy or rocky sites cleared for development. Dowling (1973) described the adverse effects of human disruption and habitat loss on nesting success. Human development has also provided novel nesting sites, such as flat gravel-coated roofs. Such sites are not without their disadvantages including flooding and the difficulty chicks face in leaving their nest site (Fisk 1978b). The Roseate Tern is considered to be threatened in Florida owing to its low population size and reportedly poor nesting success (Robertson 1978).

The nesting status of the two species in the Florida Keys has been little documented except on the Dry Tortugas. There Least Terns have nested since at least the 1850's (Robertson 1964) peaking in the early 1900's at perhaps 1,000 birds (Dutcher 1908). Nesting ceased in the 1940's, beginning again in 1973 (Woolfenden and Robertson 1974). Roseate Terns have nested on the Dry Tortugas since the early 1900's (Robertson 1964).

Because of the importance of historical documentation, in this note we attempt to summarize information on nesting sites and numbers in the Florida Keys, through the 1970's, especially that resulting from a complete census we undertook in 1976.

Simpson (1920) reported Least Terns nesting on Sand Key (now Sandy Bank) near Key West. Dowling (1973) censused terns along the Florida Keys in 1973. He found Least Terns nesting at the following locations: Key Largo, 200 pairs; Plantation Key, 15 pairs; Long Key, 20 pairs; Big Pine Key, 50 pairs; Cudjoe Key, 200 pairs; Sugarloaf Key, 25 pairs; Geiger Key, 60 pairs. All of these sites were on spoil from excavation of the coral limestone.

Our censuses were undertaken in spring and summer of 1976 in order to inventory more thoroughly the area covered by Dowling. Our censuses were conducted on May 17-23 (I), June 2 (II), June 8 (III), June 11 (IV), June 15 (V), June 25 (VI), June 26 (VII), July 6 (VIII). By mid August nesting was completed at all sites. The following are the sites, nests, and census on which we recorded Least Terns nesting: Key Largo Hammer Point, 1 I; Key Largo Lake Surprise Estates, 6 I, 6 VII; Key Largo Port Largo Estates 47 I, 5 VII; Key Largo Crocodile Lake 5 IV, 6 VI; Key Largo Rock Harbor 35 VII; Key Largo dump 30 VII; Plantation Key elementary school 7 IV; Plantation Key Port Antigua 35 IV; Indian Key fill 29 V, 10 VII; Crawl Key 9 III; Grassy Key 90 III, 190 VII; Venetian Shores 6 III; Bahia Honda Key 42 I, 10 VI; West Summerland Key 9 I; Big Pine Key Newfoundland Harbor Estates 27 I; Big Pine Key Pine Channel Estates 27 I, 32 VII; Big Pine Key Doctors Arms 65 VII; Ramrod Key 19 I, 35 VII; Big Torch Key 35 VII; Cudjoe Key 27 I, 15 VII; Noname Key 6 VII; Sugarloaf Key 120 VII; Saddlebunch Keys 17 I; Big Coppitt Key 55 VII; Geiger Key 86 I; Boca Chica Air Station 42 I, 45 VII; Boca Chica—Stock Island bridge 35 VII; Key West tank farm island 163 II; Key West airport 13 VII.

The known history of Roseate Terns nesting on the Florida Keys was summarized by Robertson (1978). He reported nesting or possible nesting at islands off Seven-mile Bridge in 1962, Crawl Key in 1962 and 1964, spoil islands in Key West Harbor in 1964, 1966?, and 1973, and Molasses Reef Rocks in 1972.

We found Roseate Terns nesting at the following sites: Indian Key fill 42 V, 2 VII; Grassy Key 13 III, 65 VII; Key West tank farm island 109 II, 263 VII.

It is not possible to estimate the total nesting population of Least Terns because some sites may have been missed, and renesting probably occurred through the period of the census. Our minimum estimate is based on the 770 nests found on 26 June, which indicated the population included over 1400 adults. Our June totals for the Roseate Tern indicated 370 nests, or at least 740 adults, as of the mid 1970's. We have no information that any similarly thorough, season-long censuses have been conducted more recently.

All of the nesting sites we found were artificial, having been created by the deposition of dredge spoil. Management of these species would require the annual discovery and protection of their chosen sites. This effort would be made especially difficult by the transient nature of most of the construction sites used by Least Terns. It is feasible, however, for suitable sites to be constructed and maintained on the several parks and wildlife refuges in the area. It is likely that the terns would use these sites, thereby assuring the continued nesting of these terns on the Florida Keys.

We thank Gary Davis and W. B. Robertson, Jr. for assistance in one of the censuses. This study was funded by the U. S. Fish and Wildlife Service.

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James A. Kushlan, Department of Biological Sciences, East Texas State University, Commerce Texas 75428 and **Deborah A. White**, 8520 SW 53 Street, Miami, Florida.

Florida Field Naturalist 13: 98-99.

Green-backed Herons feeding on decaying acorns.—In March and April 1972 I daily visited Lake Sylvan, Winter Park, Orlando, Orange County, Florida. Sometimes one or two Green-backed Herons (*Butorides striatus*) used the horizontal boughs of live oaks (*Quercus virginianus*) near the lake to roost during the day, for an hour or more on occasions. However, they would individually fly down to feed, during which I noticed they sporadically fed on the decaying and fairly soft acorns that had fallen from the oak trees. When a Green-backed Heron found some of these among the short grass they were taken to the water's edge and forcefully softened and broken open with bill-jabbing movements. Pieces were then swallowed. Those found in shallow water were also taken to the shore line and summarily dealt with as described. On a single occasion a Green-backed Heron was seen to pick over decomposed remains of a piece of grapefruit, some which was eaten.

Neither Palmer (1962, Handbook of North American birds, Vol. 1. New Haven, Conn.: Yale Univ. Press) nor Hancock and Kushlan (1984, The herons handbook. New York: Harper & Row) include the type of food I have mentioned in the diet of the Green-backed Heron.—**Bernard King** Gull Cry 9 Park Road, Newlyn, Penzance. TR18 5DZ, Cornwall, England.

Florida Field Naturalist 13: 99.

REVIEW

The Florida Scrub Jay. Demography of a cooperative breeding bird.—Monographs in Population Biology, No. 20. Glen E. Woolfenden and John W. Fitzpatrick. 1984. Princeton, New Jersey: Princeton University Press, 406 pp., 56 tables, 88 figures. $45.00 hardcover, $14.50 softcover.—In 1935, Alexander Skutch first described the phenomenon of "helpers at the nest," birds in addition to parents attending to the needs of nestlings. In the ensuing 50 years, perhaps as many as several hundred species have been reported to be cooperative breeders. Although many of these remain almost unstudied, the best known is the Florida subspecies of the Scrub Jay, *Aphelocoma c. coerulescens* (a form geographically confined to Florida). This distinction is a result of the commitment by Glen Woolfenden of the University of South Florida, later joined by John Fitzpatrick, to a long-term demographic investigation of a population of the jay. This impressive book is a progress report on the jay investigation and includes thorough analysis of the first ten years of data (1970-1979) on the population biology of individually color-banded Florida Scrub Jays.

This monograph contains ten chapters and 13 appendices. The first two chapters introduce the investigation and the methods used. It is impressive that in these days of much ballyhooed field manipulations and perturbation experiments, the Scrub Jay data have been and continue to be collected via non-intervening acute observation on a rigorous sampling regime. In fact, Woolfenden has been quite outspoken about his desire *not* to manipulate the Scrub Jay system, in order to maintain the pristine condition of this study population. Chapters three through ten discuss aspects of the population biology of the Florida Scrub Jay and are titled: The Scrub Jay in Florida; The pair bond; Helpers; Territory; Dispersal; Reproduction; Survivorship and the life table; and Evolution of Florida Scrub Jay sociality. Each of these chapters begins with a synopsis and ends with conclusions based upon the data presented in the chapter. Considering the amount of data found in most chapters, both the synopses and conclusions are quite welcome. Also included are 33 "case histories"; succinctly written, these describe details of the social history of particular family groups of jays. The case histories are included to elaborate aspects of discussion or to note exceptions to statements about social patterns. They are interspersed throughout the first half of the book and do much to emphasize further the individuality of the jays.

Woolfenden and Fitzpatrick draw numerous important conclusions from their wealth of data and are careful to distinguish conclusions from speculations and "best guesses." I have space here to discuss several findings and interpretations. First, who are helpers and whom do they help? Florida Scrub Jays are monogamous. The majority of helpers are one year old jays that remain in their natal territory and help their parents raise more young (siblings of the helpers). Approximately half of the breeding pairs of jays have helpers in any breeding season, and the average group size is three jays, the breeding pair and one helper. The sex ratio of yearling helpers is 1:1, but older helpers are predominantly males. Many female helpers (but relatively few males) disperse in the fall of their second year (at 14 to 17 months of age), and they move an average of three and a half territories (slightly more than one km); as is true for most birds, females disperse farther than males. In family groups with more than one helper, there is a rigid dominance hierarchy among helpers of the same sex, and the oldest male helper is in the best position to gain a breeding territory in this population, which exists at carrying capacity. Securing a territory may be accomplished in several ways: (1) taking over a territory made available by the death of or injury to the owner; (2) "budding" off a separate territory from the group territory; (3) inheriting the group's territory should the breeding male or breeding pair disappear; or (4)

establishing a new territory between existing territories. The first two account for more than 80% of the known instances of males obtaining breeding space. Helping benefits male helpers because it provides opportunities for obtaining territorial (=breeding) space. Although this is primarily a waiting strategy, I was intrigued with the possibility that helpers intent upon obtaining breeding space might actively remove a neighbor. Woolfenden and Fitzpatrick (pp. 272-73) note cases where a breeding adult's territory was seen to be invaded by a neighboring helper of the same sex shortly before the breeder's disappearance. Insofar as the disappearance of a Scrub Jay probably means death (see below), one is left wondering to what extent a young jay will go in order to secure a spot in the breeding population.

Woolfenden and Fitzpatrick argue that color-banded jays that disappear have died rather than dispersed beyond the study area. They support this claim with several types of evidence: (1) the well-known restriction of the Scrub Jay to the extremely patchy scrub habitat; (2) known dispersal distances for large numbers of jays in the study population [mean for males: 0.90 territories or 304 m; mean for females: 3.44 territories or 1,163 m]; and (3) surveys conducted in scrub habitat beyond the study area. Since dispersal is a major component of the social system of the Florida Scrub Jay, such information on dispersal distances and fate of dispersers is critical. Most investigators of avian social systems work with open populations in which it is not known whether individuals that disappear have died or simply dispersed beyond the study area. Woolfenden and Fitzpatrick can say much more about the "costs" of dispersing if, as they claim, the fates of dispersers are known.

Pairs of jays with at least one helper fledge 1.5 times more young than do pairs without helpers (having more than one helper does not increase fledging success). How do helpers help? It is perhaps surprising that, despite helpers feeding nestlings, this activity does not directly lead to more fledged young or young fledged at greater weights than young produced by pairs unassisted by helpers. Parents assisted by helpers simply feed their young less themselves than do unaided parents. Rather, helpers appear to decrease the probability of nest loss through predation. Predation (the evidence implicates snakes in particular) is the primary cause of nesting failure, far exceeding all other losses. Woolfenden and Fitzpatrick speculate that, because helpers feed nestlings and thereby relieve parents of some of the feeding burden, the breeding female can spend more time at the nest and by her presence deter at least some predators. Those of us working with the breeding ecology of birds that build open cup nests are well aware of the high percentage of nest losses to predators. I therefore find the relationship between helpers and reduced nest loss intuitively satisfying; what better way for helpers to help?

On to kin selection. In 1975, E. O. Wilson included discussion of the Florida Scrub Jay social system in "Sociobiology": "Thus the closest kin are strongly preferred - and a basis for the evolution of the altruistic trait [helping] by kin selection exists" (p. 454). In contrast to Wilson's interpretation, Woolfenden has always maintained that the major benefits to helpers are tallied in individual, Darwinian fitness units - that helpers remain on the natal territory and help because they gain in future individual fitness as a result. The data presented here offer some support for that claim. First-time breeders do not produce as many fledglings as experienced breeders, and first-time breeders that have helped more than one year previously fledge more young than those that have helped only one year (although, curiously, their survival rates once they become breeders are lower). While it is true that pairs helped by at least one helper raise more young to independence than do unassisted pairs (mean annual production: 1.45 vs 0.90 independent young), the authors view these Hamiltonian gains as minor and supplemental to the helpers' own Darwinian future gains that apparently result from delaying dispersal until an opening arises in the

population. Helpers would do better in terms of their inclusive fitness to themselves breed rather than help. In this population at carrying capacity, however, the option of breeding is nearly closed for a young jay. Offspring must wait for an opening, and while waiting, they remain on their natal territory and help their parents raise their siblings.

The final chapter of this monograph is a discussion of the evolution of Florida Scrub Jay sociality. Woolfenden and Fitzpatrick argue the demography of the jay population—a population at carrying capacity in a distinct, patchy habitat saturated with long-lived breeders, and characterized by high juvenile and prebreeder survivorship—favors the evolution of delayed dispersal, delayed breeding, and helping, even in the absence of kin selection. Most intriguing, they suggest that even slight changes in the demography typifying the Scrub Jay population could lead to more complex social systems, as are seen in other cooperative-breeding corvids. In particular, a change in the probability of young dispersers becoming established as breeders can have dramatic influence on the social system as modelled by the authors.

I found remarkably few typographical errors for a book of this size. Several of the coefficients of relatedness in Table 5.3 are miscalculated. On p. 65, the authors base an argument for the cost of female dispersal on a comparison of proportions producing a "difference" that does not, however, even approach statistical significance. But, these are relatively minor faults.

There is a final point worth mentioning. The Scrub Jay investigators have been fortunate to have had access to the many hectares of protected scrub habitat on the Archbold Biological Station in Highlands County. It should be of particular interest to Florida readers that non-protected oak scrub habitat occupied by Scrub Jays decreases in area yearly. In addition to the jays, there are many vertebrates, invertebrates, and plants restricted to or most common in scrub habitat, and this entire community is under siege by land-hungry Floridians. Hundreds of hectares of scrub habitat per year are developed or degraded, and only a small fraction remains of the original extent of scrub habitat. The protection afforded by the Archbold Biological Station has made possible the jay project and one hopes will insure the future of the study. It is therefore fitting that this monograph is dedicated to the memory of Richard Archbold, one of the last of the great explorers and renowned patron of the biological sciences. It is sobering to reflect that the extraordinary social behavior of the jays—this best-studied example of a cooperative-breeding bird—might never have been known if an investigation had been started in a non-protected patch of scrub habitat destined for the bulldozer or if a "Woolfenden" type of biologist had attempted to begin such a project in the year 2000 rather than 1970.

Potential readers should be aware that this is a book primarily for biologists. Students of animal social behavior and population biology will surely benefit from reading it. Non-biologists interested in bird behavior and ecology will without doubt find much for them here also, although they may encounter some esoteric patches in the theoretical and mathematical discussion in the final chapter on the evolution of jay sociality.

In summary, Woolfenden and Fitzpatrick's monograph is an extremely important, well-written treatment of the social behavior and population biology of a cooperative-breeding bird. I doubt that there is a current investigator of any other such system who could hope to match this effort with present knowledge—the data for no other species are as extensive as those presented for the Florida Scrub Jay. I am already anticipating a subsequent edition . . . which I presume will appear after the second decade of data collection. I thank Oscar Owre for comments on this review.—**Randall Breitwisch**, Department of Biology, University of Miami, Coral Gables, Florida 33124.

Florida Field Naturalist 13: 100-102.

REPORTS

Summary of the 1985 fall meeting.—The fall meeting of the Florida Ornithological Society was held at the Ramada Inn in Altamonte Springs, Florida. Dot Freeman and the Orange County Audubon Society were our hosts from 13-15 September. President Bob Brown thanked the local committee for their efforts and announced the dates of the next spring meeting at Plantation Key (2-4 May). A trip to the Dry Tortugas is being planned for before the meeting.

During the board meeting, Oron Bass was elected to the Records Committee to complete the unexpired term of Wayne Hoffman, who has moved from Florida, and Larry Hopkins was elected to a full term. Rich Paul was appointed to the Research Awards Committee. President Brown proposed a series of informal Birding Weekends for socializing and birding at Florida's great birding locations during their peak season. Cost to participants would be $10 to go to the Research Fund. The Board voted unanimously to rename the research fund the Helen G. and Allan D. Cruickshank Research Fund.

Field trips on Saturday and Sunday were held to Wekiva Springs State Park, Zellwood muck farms, and Discovery Island, where visitors were treated to a glimpse of the last Dusky Seaside Sparrows.

The faculty and graduate students of the University of Central Florida presented papers at the technical session. Dr. Llewellyn Ehrhart of UCF moderated the session. The papers presented were: "Vocalizations of the Great Crested Flycatcher, *Myiarchus crinitus* (L.)," by Walter K. Taylor; "Breeding biology of the Great Crested Flycatcher," by Mark Kershner; and "Comparisons of three recent episodes of marine turtle cold-stunning in Mosquito Lagoon, Florida," by Blair E. Witherington. Herb Kale and Wes Biggs presented a mini-workshop on the Florida Breeding Bird Atlas project.

Jeff Moore again prepared a song quiz, which was won by Henry Stevenson. His prize was a cassette of "Songs of New World Thrushes" from ARA Records. The skin quiz was prepared by Dr. Taylor and included eggs in addition to the traditional study skins. Peggy Powell was the winner of the skin quiz, and her prize was a carving of a wren.

The speaker at the Saturday evening banquet was Dr. Bernie Yokel, President of Florida Audubon Society. His topic was the economic values of wetlands.—**Bruce Neville,** 8221 SW 72 Ave. #273, Miami, Florida 33143.

Florida Field Naturalist 13: 103.

FLORIDA ORNITHOLOGICAL SOCIETY SPECIAL PUBLICATIONS

Species index to Florida bird records in Audubon Field Notes and American Birds volumes 1-30 1947-1976, by Margaret C. Bowman. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00.

The Carolina Parakeet in Florida, by Daniel McKinley. 1985. Florida Ornithological Society, Special Publication No. 2. Price $6.00.

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ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The Florida Field Naturalist is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 14, NO. 1 FEBRUARY 1986 PAGES 1-28

NESTING STATUS AND COLONY SITE VARIABILITY OF LAUGHING GULLS IN SOUTHERN FLORIDA

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Abstract.—Laughing Gulls (*Larus atricilla*) used twenty-six nesting sites in Florida Bay, southern Florida, from 1976 through 1982, breeding from mid-April to August. Colony site use and nesting numbers were highly variable, and nesting success appeared to be poor. Fewer than half of the known nesting sites were used in any year. Limiting factors included flooding and food availability. We hypothesize that the southern Florida nesting population may be of relatively recent origin resulting from repeated colonization by birds from further north. It appears to be supported primarily by the availability of sanitary landfills and agricultural fields, and so may be affected as these types of land uses are scaled back in southern Florida.

The Laughing Gull (*Larus atricilla*) is a familiar bird along the southern Florida coast, but little attention has been paid to its status, probably because it is so common. The first and only enumeration of its nesting population was a series of censuses by Kushlan and White (1977) in the mid 1970s. According to these data the breeding population appears to be much smaller than populations further north (e.g., Patton and Hanners 1984). It is also at the southeastern limit of its continental North American range and thus may be in a marginal environment.

In this paper we report on the status of the Laughing Gull in Florida Bay, based upon censuses conducted from 1976 through 1982. We also have examined historic information on the species in southern Florida and draw inferences with respect to its history in the area. The results of our study indicate that this group has a highly unstable nesting pattern.

Florida Field Naturalist 14: 1-17, 1986.

Figure 1. Map of Florida Bay showing Laughing Gull colony sites. See Table 2 for numerical key to colony sites.

Methods

The study was conducted in southern Florida, especially in Florida Bay (Fig. 1). We located all nesting sites in Florida Bay each year from 1976 through 1982 using helicopter and fixed-wing aircraft. In 1976, 1981 and 1982, we conducted ground censuses at each colony site having more than five nests. All potential sites were observed monthly or every other month year-round in 1977-80. In 1981-1982 they were observed from April through August. In 1982 detailed observations were made to evaluate the effects of heavy rainfall on nesting. To analyze the status of Laughing Gulls in winter, we examined the results of Christmas counts held in or near the study area (published in Audubon Field Notes and American Birds). We also examined all available historic information including published literature and unpublished notes available in the files of the Everglades National Park, National Audubon Society, and U.S. Fish and Wildlife Service Refuges.

Analyses were performed using SPSS, SAS statistical packages at Florida International University and East Texas State University. Equitability was calculated as $E' = H'/\ln S$, where $H' = p_i \log p_i$, p_i=proportion of the gull population in each colony, and s= total number of colonies. Turnover rate was calculated as $T = (1/2)((S_1/n_1) + (S_2/n_2))$, where S_1 = number of sites occupied only on first survey, S_2 = number of sites occupied only on second survey, n_1 = total number of sites occupied on the first survey, and n_2 = total number of sites occupied on the second survey (Erwin et al. 1981).

RESULTS

Historical Information.—The nesting status of the Laughing Gull in southern Florida prior to the last decade is problematical at best. Only a few records even suggest that Laughing Gulls nested historically in extreme southern Florida. Audubon (1967) observed this species "on the shores and keys of the Floridas, where [he] found it breeding." Howell (1932) cited Nicholson as reporting a small colony in 1927 on a mangrove island near Tavernier and also stated that "Bent and Job discovered a breeding colony on a key near Cape Sable." However, nesting was not actually documented in the original report, which stated: "On a large, partly sandy key we found a colony of Laughing Gulls preparing to breed" (Dutcher 1904). Bent (1921) himself did not include the southern part of the state in the breeding range of the species in Florida.

The remaining historical records come from unpublished notes by federal and conservation society personnel taken during sundry aerial wildlife surveys flown over Florida Bay. The earliest such record was at East Key in 1949. Three hundred gulls were reported flying over Stake Key in July, 1964 "possibly nesting." On June 30, 1965, over 60 birds were observed in the air and on the ground at Curlew Key "probably nesting." In mid-July, 1967, "apparent nesting" was reported on an island southeast of Buoy Key, and on Curlew, East and Rabbit keys. No ground censuses of nests or birds were reported throughout the historical record. Because we found a multitude of references to large numbers of Laughing Gulls without mention of nesting, we suspect that any actual nesting observed in southern Florida would have been reported. The first explicit census of Laughing Gull nesting in southern Florida came from the survey conducted in 1976 (Kushlan and White 1977).

Census techniques.—We found considerable differences in the censuses of Laughing Gull colonies conducted by different methods (Table 1). We attempted to discriminate between the methods with respect to the situation in Florida Bay.

Colonially nesting wading birds are frequently censused using aircraft, most commonly fixed-wing airplanes. However we found in attempting to census Laughing Gull colonies that it was not usually possible to discriminate between nesting and nonnesting birds present at a potential colony site. Thus it is not appropriate to infer directly the number of nests present from a count of birds made from a fixed-wing airplane.

Table 1. Comparisons of censuses of Laughing Gulls conducted from the ground and from helicopters in 1981 and 1982, and the proportion of nests containing eggs.

Colony Site	1981			1982		
	Helicopter Aerial Count of Birds	Ground Count of Birds	Ground Count of Nests (% egg nests)	Helicopter Aerial Count of Birds	Ground Count of Birds	Ground Count of nests (% egg nests)
3 Barnes Key	20	40	63 (36)			
8 Captains Key	11	35	22 (100)			
9 Cluett Key	85	120	105 (43)	60	40	7 (43)[1]
12 Dead Terrapin Key	41	81	76 (18)			
20 S.E.-of-Pelican Key				35	75	46 (48)
14 Low Key	59	120	139 (24)	100	85	61 (36)
15 Manatee Key	45	70	72 (4)	150	280	143 (91)
16 Man-of-War Key	46	50	8 (0)			
17 North Nest Key	65	90	92 (12)	315	375	216[1,2]
19 Pelican Key	22	22	25 (4)			
23 Sid Key	35	35	44 (20)			
24 Stake Key	35	65	119 (16)	250	250	208 (89)
25 Topsy Key	35	35	36 (22)			
26 Twin Key	110	90	134 (16)	17	32	23 (26)

[1]Nest number estimate from nest counts in one portion of colony.
[2]Not included in regression analysis because ground counts were not complete.

Counts of birds at potential colony sites made from helicopters were generally higher than those made from fixed-wing airplanes. We evaluated the relationship between counts of birds made from helicopters and the number of nests present on the same day. The best relationship ($Y = -10.653 + 1.068\ X$, $S_b = 0.172$, $P < 0.001$, $R^2 = 0.694$, where Y is the aerial bird count and X is the ground nest count) seriously underestimated nest counts of the larger colonies. The difference between the predicted bird count and actual bird count for 210 nests was over 50%, and eliminating high nest counts failed to improve the overall realtionship for the smaller colonies. Thus it seems that the variability between counts of birds from helicopters and ground counts of nests is too great to be useful in such a small population.

We also evaluated the relationship between counts of birds at colony sites made from the ground to the actual number of nests present on the same day. Ground counts of birds were best predicted from the independent variable of nest counts using a semilog transformation ($\text{Log } Y = 3.408 + 0.011\ X$, $S_b = 0.001$, $R^2 = 0.80$, $F = 66.98$, $P < 0.0001$, where Y is the ground count of birds and X is the actual nest count). Clearly ground counts of birds were more closely related to nest counts than were either of the aerial techniques. It would be possible to generate a correction factor by running the regression analyses backward, as was proposed by Kadlec and Drury (1968), in order to be able to use bird counts to predict nest counts.

However in the population of Laughing Gulls we studied, it is not clear what the actual nest count means. In that a large proportion of nests did not contain eggs (Table 1), the actual reproductive effort was lower than the count of nests. The instability of nesting further increases the uncertainty of any point count. Considering that the colonies are small and adversely affected by disturbance (see below), it would seem that none of these techniques used were adequate for monitoring the population actually nesting.

Nesting population.—Because of the uncertainty in relating bird counts to nest counts and nest counts to nesting status, we express our population figures directly as the number of birds actually counted at colony sites. Based on the highest month's count from each active colony, we estimate that the nesting season population ranged from 280 in 1980 to 1618 birds in 1982 (Table 2). The number of gulls counted at any potential colony site was relatively small, averaging about 60 birds (range 3 to 250, mean=59.3, s=56.58, n=96). The number of nests actually counted per site was also small, averaging about 70 nests (range 1 to 216, mean=70.4, s=60.53, n=32, 1976, 1981, 1982) (Table 3).

Table 2. Peak number of Laughing Gulls occurring on islands in Florida Bay from April through August in 1976 through 1982.

Colony Site	Year 1976	1977	1978	1979	1980	1981	1982
1 Lower Arsnicker Key	30	0	25	0	0	11	0
2 Upper Arsnicker Key	3	20	85	0	0	4	0
3 Barnes Key	50	25	50	50	35	20	50
4 East Buchanan Key	1	20	100	0	0	16	0
5 West Buchanan Key	0	70	110	80	125	0	80
6 Buoy Key	0	0	0	0	0	0	3
7 S.E.-of-Buoy Key	30	100	30	35	0	18	55
8 Captains Key	0	0	0	0	0	11	15
9 Cluett Key	30	30	75	125	0	85	100
10 Crane Key	0	0	0	20	0	0	0
11 Curlew Key	25	100	25	0	0	16	20
12 Dead Terrapin Key	0	0	0	0	0	45	0
13 East Key	100	0	5	0	0	0	4
14 Low Key	0	0	0	15	40	59	180
15 Manatee Key	0	0	0	0	0	45	150
16 Man-of-War Key	60	12	0	10	0	46	55
17 North Nest Key	125	0	85	80	40	65	315
18 South Nest Key	0	230	90	80	0	0	0
19 Pelican Key	75	120	205	75	0	22	20
20 S.E.-of-Pelican Key	20	3	100	0	0	0	130
21 Big Rabbit Key	30	0	0	0	0	0	12
22 Little Rabbit Key	0	70	65	20	0	5	0
23 Sid Key	0	0	0	0	0	35	9
24 Stake Key	0	15	35	85	40	35	250
25 Topsy Key	0	0	0	0	0	35	50
26 Twin Key	0	0	0	0	0	110	120
Total number of birds	579	815	1085	675	280	683	1618
Total number of locations occupied	13	13	15	12	5	19	19

Nesting chronology.—Laughing Gulls nest in Florida Bay in spring and summer, beginning mid-April to May. In only two instances were gulls observed at potential colony sites as early as mid-April. Our monthly data from 1976 to 1981 showed that peak numbers occurred 38% of the time in May, 25% of the time in June, and 23% of the time in July. The mean number of gulls per colony did not differ significantly among months ($F_{(3,40)}=0.195$, $p<0.75$). (Because of the variability in site occupancy noted below, this mean was not over the same colony sites throughout the season.) Gulls were seldom present at colony sites after August. We observed young in colonies beginning in July but expect that some hatching occurred earlier.

Table 3. Number of Laughing Gull nests counted from the ground.

Colony	Year		
	1976	1981	1982
1 Lower Arsnicker	30	0	0
2 Upper Arsnicker	3	0	0
3 Barnes	60	63	6
4 East Buchanan	1	0	0
5 West Buchanan	0	0	0
6 Buoy Key	0	0	0
7 S.E. of Buoy Key	30	0	0
8 Captains	0	22	0
9 Cluett		105	
10 Crane	0	0	0
11 Curlew	35	0	0
12 Dead Terrapin	0	76	
13 East	183	0	0
14 Low	0	139	61
15 Manatee	0	72	143
16 Man-of-War	60	8	0
17 North Nest	125	92	216
18 South Nest	0	0	0
19 Pelican	75	25	0
20 S.E. Pelican		0	46
22 Little Rabbit	0	5	0
23 Sid	0	44	0
24 Stake	0	119	208
25 Topsy	0	36	23
26 Twin	0	134	0
Total number of nests	602	940	710

We found considerable variability in timing of nesting at a colony site in different years and among colony sites in a single year. In fact, new colony sites were occupied as late as August indicating substantial nesting asynchrony among southern Florida Laughing Gulls. Birds were present at some sites on only one or two monthly censuses, suggesting that some of the variation may have resulted from nesting failure followed by shifts to other colony sites. It could also be the result of differences in the timing of food availability at different sites.

Colony site distribution and stability.—Laughing Gulls occupied 26 islands (called keys) in Florida Bay during the nesting seasons from 1976 through 1982 (Figure 1, Table 2). We found an unexpected lack of colony site tenacity between years. The mean occupancy of any colony was only

Table 4. Turnover in the use of Laughing Gull colony sites in Florida Bay, 1976 through 1982.

Years Compared	Turnover Rate[1]
1976, 1977	0.31
1977, 1978	0.14
1978, 1979	0.32
1979, 1980	0.29
1980, 1981	0.43
1981, 1982	0.26

[1]See Methods section for calculation.

3.7 years (s=1.83, n=7), and the mean number of colony sites used per year, 13.7 (s=4.78, n=7), was only about half the total number of sites used over the entire study period.

Turnover rates, a measure of colony site stability, were calculated for sequential years (Table 4). These were relatively high averaging 0.29 (s=0.094). The highest turnover rate was between 1981 and 1980, a year when very few sites were occupied.

Equitability of population distribution among colony sites was calculated over the number of colonies active in each year (Table 5). Generally equitability was lower than expected if birds had evenly distributed themselves among colonies (maximum equitability in Table 5). The mean equitability over the 7 year period, 0.383 (s=0.028), was significantly lower than the mean maximum equitability, 0.435 (s=0.002) (T=4.333, df=12, $p<0.001$).

We examined whether the frequency of colony use was related to the number of birds using the site (Table 2). We found that the larger colonies were more frequently used (Spearman rank correlation $r_s = 0.38$ corrected for ties, $p<0.05$).

Nest sites.—In southern Florida Laughing Gulls nested only on natural islands. Nests were clumped around the base of red mangroves (*Rhyzophora mangle*) and were dispersed in low herbaceous vegetation, including *Batis maritima* and *Sesuvium portulacastrum*. At two locations Laughing Gulls selected sites in tall grasses including *Cenchrus myosuroides* and *Spartina bakerii*. Each of these sites were typically in or adjacent to open salt pans formed by the evaporation in the dry season of rainfall or overwash salt water.

Table 5. Equitability in distribution of birds among colonies in the years surveyed, 1976-1982.

Year	Number of Locations	Total Number of Birds Present	Equitability[1]	Maximum[2] Equitability
1976	13	579	0.350	0.435
1977	13	815	0.350	0.435
1978	15	1085	0.401	0.432
1979	12	675	0.398	0.433
1980	5	280	0.393	0.434
1981	19	683	0.422	0.437
1982	19	1618	0.365	0.437

[1]See Methods section for calculation.
[2]Calculated based upon an even distribution.

The nests under mangroves were generally larger than those in the herbaceous vegetation. Mangrove sites also appeared to have a higher frequency of completed clutches and a higher nest density, but the concentrated nesting described by Dinsmore and Schreiber (1974) was not found in southern Florida.

Nesting effort and success.—On ground visits made in late May through early June in 1976, 1981 and 1982, we found limited nesting success, and on post-nesting aerial surveys we observed very few juveniles over the entire study area.

Signs of human disturbance such as footprints and litter were found on several of the nesting islands, and this may have contributed to nest losses.

Additionally we found flooding of nests to be common. Most nest sites selected by Laughing Gulls were in or adjacent to salt flats that were frequently flooded by wind-driven tides and rainfall. Kushlan and White (1977) reported large numbers of drowned chicks and eggs after flooding in 1976, and in 1981 we observed abandonment of colonies by gulls after the sites had flooded.

Food availability is also a potential limiting factor for gulls in Florida Bay. We know little about the food or habitats used by gulls in Florida Bay in that they were seldom observed feeding any where other than near marinas. However we consistently observed gulls feeding in agricultural fields and landfills. Three landfills readily accessible to gulls nesting in Florida Bay were on Key Largo, Long Key, and Cudjoe Key (Fig. 1). Incineration of waste began in 1981 and 1982 at all three sites. To test the possible effect of this potential change in food availability, we conducted an aerial survey in late August, 1982 and found no birds foraging at the Key Largo and Long Key sites.

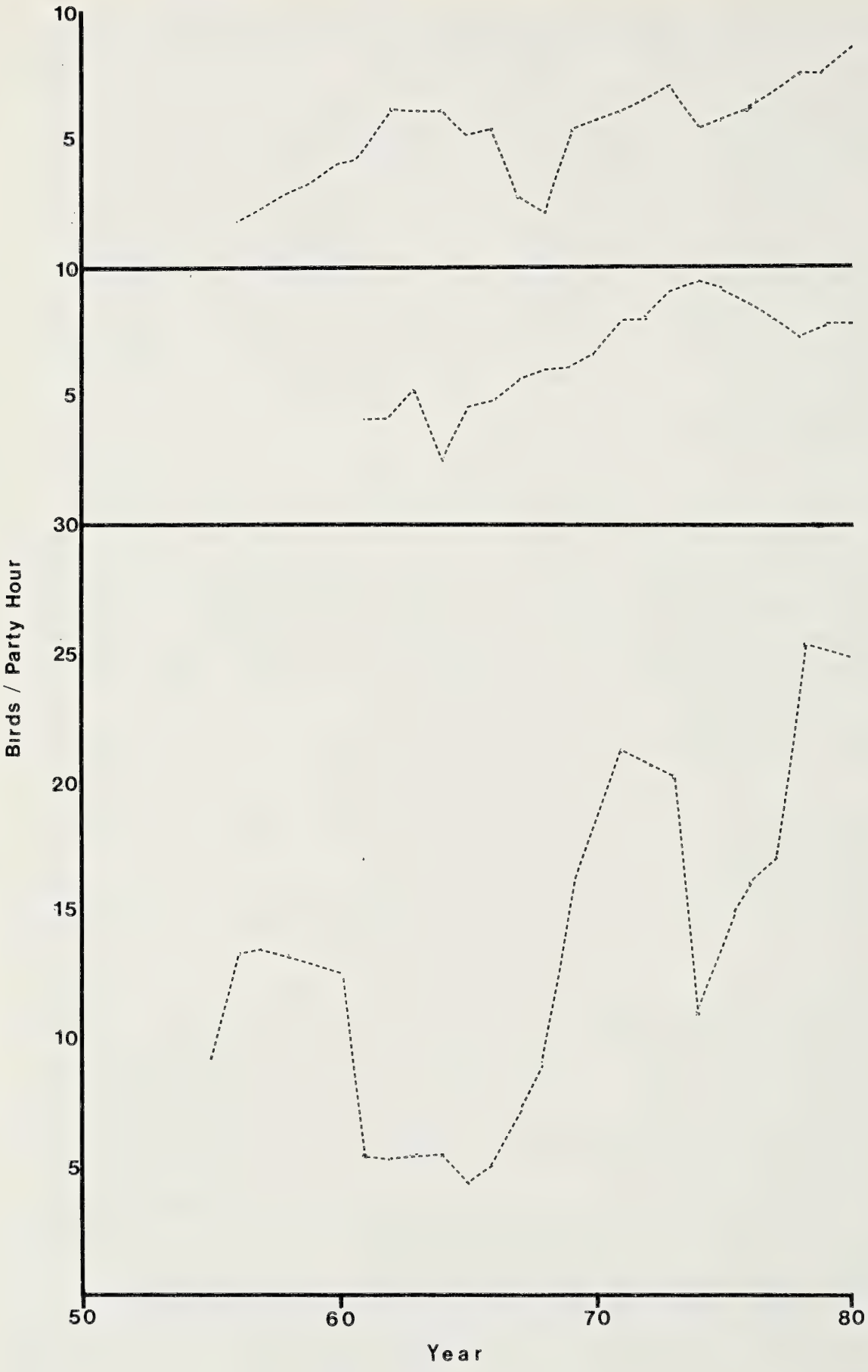

Figure 2. Five year moving averages in Laughing Gulls counted in three southern Florida Christmas counts. Top: Lower Florida Keys. Center: Upper Florida Keys. Bottom: Northwest Florida Bay.

Table 6. Numbers of Laughing Gulls recorded in southern Florida Christmas counts.[1]

Year	Total number (number/party hour) Northern Biscayne Bay	Northwest Florida Bay	Upper Florida Keys	Lower Florida Keys	Total
1975	12,725 (126.0)	6,160 (29.6)	543 (8.2)	311 (4.5)	19,739
1976	10,000 (80.6)	6,058 (34.2)	319 (6.0)	345 (7.1)	16,722
1977	18,862 (115.7)	1,927 (10.6)	444 (7.7)	588 (9.9)	21,821
1978	no data	8,012 (47.5)	461 (6.11)	360 (7.3)	—
1979	15,464 (88.9)	3,324 (25.8)	532 (10.5)	444 (8.8)	19,764
1980	23,137 (661.1)	800 (6.3)	358 (7.4)	501 (10.3)	24,796
1981	10,017 (233.0)	3,233 (24.1)	268 (5.36)	418 (8.1)	13,936
1982	15,683 (155.3)	2,177 (17.7)	348 (6.8)	239 (4.0)	18,447

[1]Northern Biscayne Bay = Dade County Count, Northwest Florida Bay = Coot Bay Count, Upper Florida Keys = Upper Florida Keys Count, Lower Florida Keys = Lower Florida Keys Count. Data from American Birds.

Winter population.—Laughing Gulls occur in southern Florida throughout the year. No historical information on total wintering numbers exists, although numerous unpublished notes recorded their presence in small concentrations prior to 1950. Christmas counts from three areas immediately surrounding Florida Bay show a gradual increase in wintering numbers (Figure 2) from the early 1950s to 1982. Although the areas covered by Christmas counts are small portions of the wintering grounds for gulls in southern Florida, the data indicate that the wintering population far outnumbers the nesting population (Table 6).

Banding recoveries suggest that Laughing Gulls recovered in southern Florida originated from nesting grounds further north, including 75 from New Jersey, 35 from Virginia, 19 from Maryland, 11 from South Carolina, 5 from Wisconsin, 1 from Minnesota, 1 from North Carolina, and 2 from Mississippi. Banding data also suggest that gulls nesting in Florida either remain in Florida or move southward as far as the Caribbean. They seem not to disperse northward. This presumably is also the case for birds nesting in southern Florida.

Discussion

Census techniques.—Aerial counts out of fixed-wing aircraft are the least accurate technique available for censusing colonial waterbirds, including Laughing Gulls. The advantages are logistical, in that it is efficient with respect to cost and time. It also to known to be minimally disruptive to a nesting population (Hutchinson 1979). Fixed-wing censuses for Laughing Gulls were adequate only to determine the number

of birds present at a colony site. Underestimates will result from incubating birds not being visible from the air, and overestimates from non-nesting Laughing Gulls congregating at a colony site.

Helicopters usually produced higher counts because birds on nests under the mangroves could be seen. Thus helicopters provided a more accurate count than did fixed-wing aircraft. Disturbance was similar to that of fixed-wing aircraft in some cases but differed among colony sites. In one instance not a single bird flew up and several remained on nests within 50 meters of our landing site. In other cases birds took to the air and remained in the air until we left the colony. Counts of birds taken from helicopters underestimated the nests present in the largest, and therefore most important, colony sites.

Ground counts of birds at colony sites were higher than counts taken from a helicopter. Regression analysis showed nest counts were related to ground counts of birds. Thus this technique might be applicable to censusing nests without counting them (Kadlec and Drury 1968). In that such counts can be done from outside the nesting area they are less disruptive than walking through the colony for a nest by nest count.

It is usual to use corrections factors to estimate nesting numbers from counts. Nisbet (1971) divided the number of adults counted from the ground by 1.2 and 1.8 depending upon the evaluation of the number present but not nesting. Erwin (1979) proposed a factor of 1.0 to convert aerial estimates of adult Laughing Gulls to number of nesting pairs (nests). In Florida Bay use of regression models to convert between bird counts and nest counts is not appropriate because of the strong effect of errors in estimating such a small population and the unknown, and perhaps nonexistent, relationship between nest counts and nesting effort.

In conducting ground nest counts we found many empty, poorly constructed nests which we suspect were unused (Ryder 1976). Dinsmore and Schreiber (1974) found unused nests in Laughing Gull colonies, noting more unused nests occurring among later nesting birds and a higher frequency among late nesting young birds. If this occurred in Florida Bay, the actual nesting population may be considerably smaller than the number of nests we counted.

An appropriate monitoring scheme in southern Florida would involve monthly aerial surveys from April through August to identify potential nesting locations. In order to assess the changing status of this small and variable nesting population, the actual productivity needs to be monitored.

Wintering and nesting numbers.—We found sporadic counts of wintering concentrations in unpublished notes, but no total censuses for the entire study area. From the 1950s onward, Christmas counts show an increase in numbers of Laughing Gulls throughout the area peripheral to Florida Bay.

Historical records of Laughing Gulls nesting in Florida Bay are depauperate. We have only the ground censuses conducted in 1976 as concrete evidence of nesting prior to our study. Lack of verifiable nesting records suggests that nesting at the level we found it may not be a longstanding phenomenon in Florida Bay.

Using flight data alone, we estimate that a maximum of 1618 Laughing Gulls occurred at potential colony sites during the period of study. We must conclude this is a small population relative to other populations, such as the 50,000 reported from Tampa Bay (Patton and Hanners 1984). The low number of gulls occurring in 1980 demonstrates the high variation in nesting effort in different years.

Nesting chronology.—The Laughing Gull nesting season is extended over a longer, less synchronous period in Florida Bay than in the nearest nesting sites studied, Tampa Bay. In this more northern area, Dinsmore and Schreiber (1974) determined that gulls complete their nesting cycle from egg-laying to fledging from early May to late June. In southern Florida we found no significant differences in mean number of gulls per colony among the months of April through August; abandonment and establishment of colonies occurred throughout these months each year. This extended nesting period cannot be specifically attributed to the more tropical latitude of Florida Bay, as Morris (1984) found a sharp peak in clutch initiation in late April and early May among Laughing Gulls nesting on Little Tobago, West Indies.

The synchronous nesting in the West Indies occurred during the spring dry season. In Florida Bay the prolongation of nest initiation throughout the summer wet season would seem less conducive to success than would nesting during the dry season of early spring, more comparable in timing to Trinidad. We know of no ecological reason why gulls in southern Florida should nest in the rainy season, during which their colony sites are subjected to frequent flooding. Such summer nesting characterizes populations nesting further north, suggesting that the Florida Bay population may be the result of repeated colonization by these more northern birds.

Colony site use.—Variation in colony site use was high, and equitability was low in that frequently used sites held most of the birds. Over the several year study period Laughing Gulls occupied 26 islands in northern Florida Bay, but the mean number of colonies active per year was only 13.7. Each colony was occupied in about half of the 7 years of the study. Thus colony site stability (McNicholl 1975, Southern 1977) was relatively low.

Laughing Gulls elsewhere show rather strong colony site stability (Stone 1937, Nobel and Wurm 1943, Bongiorno 1970, Dinsmore and Schreiber 1974, Nisbet 1971, Burger and Schisler 1978, 1980, Erwin et al. 1981). Turnover rates have been reported as 0.10 in North Carolina, 0.19 on the Delmarva Penninsula, and 0.20 in New Jersey (McCrimmon and Parnell 1983, Erwin 1978, Erwin et al. 1981). However inappropriate averaging and wide confidence limits impairs quantitive comparisons with our data (Frohring and Kushlan in prep.).

Colony shifts have been attributed to external factors such as predation (Montevecchi 1975, 1977, Nisbet 1971, Southern 1977), human disturbance (Gillett et al. 1978, Conover and Miller 1978, Burger 1981), tidal washouts (Burger and Schisler 1980), competition for suitable habitat and vegetational changes (Nesbit 1971, Burger and Schisler 1978, 1980, Patton and Hanners 1984). Previous nesting failure also has been proposed as a factor causing shifts in colony location (Southern 1977).

Competition for space limits colony site use by Laughing Gulls elsewhere. Dinsmore and Schreiber (1974) found that with increased density of nesting at a colony in Tampa Bay, Laughing Gull clutch size decreased suggesting that the colony might be reaching limits of maximum productivity. Because only about half of the islands known to be used as colony sites were occupied in any year we do not expect colony use to be related to density limits. Abandonment and colony shifts also have been attributed to competition for nesting space with larger species of gulls (Nisbet 1971, Burger and Schisler 1978, Erwin et al. 1981). The only other species nesting near Laughing Gulls in Florida Bay is the Least Tern (*Sterna albifrons*), so this population does not experience such interspecific competition for nesting space.

Limiting factors.—We saw some evidence of predation in the colonies we visited, especially in 1981. Laughing Gulls are known to have a less developed anti-predator response to ground predators than other gull species (Montevecchi 1977). Avoidance, noted as an anti-predator mechanism among other larids (Cullen 1960, Kruuk 1964), may be one reason why Laughing Gulls did not nest in the middle of Florida Bay where islands are easily accessible to raccoons.

Human disturbance will cause Laughing Gulls to puncture their own eggs (Bongiorno 1968, Schreiber et al. 1979). Therefore the source of cracked eggs that we observed in 1981 may have ultimately been gulls themselves in response to human visitation rather than heterospecific depredation. We know that some of the islands were visited by humans because of debris, footprints, and other such evidence. Some colony sites such as Nest Key are regularly visited by people yet reform yearly, so disturbance does not seem to affect colony formation. In that this factor is known to affect nesting success in larids elsewhere (Burger 1981), it probably contributes to the apparent low productivity in Florida Bay.

Tidal washouts flood Laughing Gull nesting colonies all along the Atlantic Coast. Burger and Schisler (1980) noted that nesting colonies in New Jersey shifted, and the birds nested in more concentrated groups on higher elevations a year following flooding. These authors and Borngiorno (1970) also recorded gulls renesting within a season either at the same or different locations after tidal flooding destroyed most of the nests. Flooding due to rainfall and wind-driven tides may account for some of the monthly and annual shifts of colony sites observed in Florida Bay, but some colony sites are reused despite repeated flooding. Horseshoe Key in the lower Florida Keys, for example, flooded in 1976 causing mortality among later nesting birds (Kushlan and White 1977), yet has been reused. North Nest Key periodically floods yet is one of the most consistently used sites. Variation in response may occur when only some nests are destroyed by flooding within a colony, perhaps because the eggs experienced different emersion times (Burger 1979).

We suggest that food availability may be a limiting factor for Florida Bay gulls, and that the opening of artificial food sources in southern Florida may have led to the development of the current nesting population of Laughing Gulls in southern Florida. Patton and Hanners (1984) suggested that the opening of landfills may have caused the increase in nesting sites observed in birds in Tampa Bay. Both they and Dinsmore and Schreiber (1974) reported that a large portion of food regurgitated from the Tampa Bay Laughing Gull chicks came from landfills. The human population in the Florida Keys doubled from 12,768 in 1970 to 25,108 in 1980 (R. Goldstein pers. comm.), providing an increasing food base at landfills in the Florida Keys. However technical changes may have recently reduced food availability at these sites, as they have at the 58th Street landfill in Miami, which is heavily used by wintering gulls. There the amount of exposed waste available to foraging birds has been reduced from ten acres to one-half an acre (T. Sobrino pers. comm.).

Agricultural techniques have been implemented over the past twenty years that permits the same land to produce two crops every year rather than one crop on alternate years. Because preparation of individual fields is staggered over a period from spring to fall, food resources are continuously made available, and these fields are occupied by aggregations of gulls before, during, and after nesting season. However this reliable, concentrated food resource is diminishing at the rate of 10,000 acres per year (R. Champagne pers. comm.) in southern Florida as land is developed.

Population characterisitics and status.—The Florida Bay Laughing Gulls represent a small nesting population at the edge of its North American range. It exhibits a nesting schedule that renders its nesting susceptible to flooding, which appears to limit production. It seems possible that nesting on an extended late spring to summer schedule is a reflection of the genetic composition of a population derived from repeated colonization by more northern birds. It is also possible that the present nesting population is a rather recent phenomenon resulting from the provisioning of artificial food sources. If so we can expect it to be afffected by future reductions in the availability of these sources.

Acknowledgments

We thank those who assisted in the field Oron L. Bass, Linda McEwan, Dorothy Peck, and Deborah White and especially our pilots Larry Carmody, Art Lussier, and Don Mitchell. We also thank for their co-operation Jim Baker of the Monroe County Municipal Service District, Tony Sabrino of the Dade County Solid Waste Disposal Units, Roy Champagne of the Dade County Argicultural Extension Office, and Ronnie Goldstein of the Monroe County Library. This study was funded by the US National Park Service.

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NOTES

A fledgling Brown-headed Cowbird specimen from Pinellas County.—First evidences of breeding in Florida by the Brown-headed Cowbird (*Molothrus ater*) were in 1956 and 1957 near Pensacola (Sprunt 1963, Weston 1965). Since then the species has become a common breeder throughout northern Florida and now is spreading rapidly southward in the peninsula. Here we report first evidence of breeding in Pinellas County, halfway down Florida peninsula, and describe Tampa Bay area population increases of the species during recent summers.

A young fledgling Brown-headed Cowbird was brought to the Suncoast Seabird Sanctuary in Pinellas County on 2 June 1985. It died the same day. Precise locality data were not kept, but little doubt exists the bird was obtained locally. Rarely are birds brought to the sanctuary from outside the county, and for these more precise locality data are kept. The specimen, a female (ovary 3.5 X 3mm, not granular), weighed only 17.5 grams. It is preserved as a study skin (GEW 5736) at the University of South Florida. The primaries and rectrices have remnants of sheaths and the tail (56.5 mm total length) is about 10 mm shorter than average for adult females. Cowbirds typically weigh about 30 grams at fledging (Mayfield 1960). The incomplete feather growth and light weight support a local origin for the bird.

The Nesting Season reports in American Birds and its predecessor Audubon Field Notes provide a good account of the expansion of the Brown-headed Cowbird's breeding range in Florida. Several specimens in the Florida State University bird collections provide documentation of the event. The species spread through the panhandle, crossing the Apalachicola River around 1960 (Stevenson 1959, 1960). Cowbirds were breeding commonly in the Tallahassee region by 1965, the year the Jacksonville area had its first June record (Ogden 1965). FSU specimens 6880g-h document breeding at Alligator Point, Franklin Co. in June 1967; and FSU 6880j, a specimen of a fledgling that was being fed by a Parula Warbler (*Parula americana*), demonstrates breeding in Jackson Co. in May 1968. By 1980 fledglings were reported throughout northern Florida from Pensacola to Jacksonville and south in the peninsula to Gainesville (Edscorn 1980). In the Tallahassee Region summering cowbirds became common along the coast a few years earlier than inland, and a similar pattern is apparent for northeast Florida.

Intensive studies of breeding land birds in lower Pinellas County during the early 1960s produced no records of cowbirds (Woolfenden and Rohwer 1969). A county-wide summer bird count has taken place from 1970 through 1985. Only one Brown-headed Cowbird was recorded before 1981, but the species has been recorded on four of the five counts since 1981, with a maximum of six individuals reported in 1985. All records are coastal (*fide* Dave Goodwin). Lyn Atherton censused land birds in and near Ft. DeSoto County Park, at the southern tip of Pinellas County, in 1984-85, and generously shared her records of cowbirds. In 1984 she recorded cowbirds in the park 6 days in April (1-6 birds per day), 9 days in May (1-7 birds), and once in June. On 23 May she observed a pair copulating, and on 1 September two streak-breasted juveniles. In 1985 she observed cowbirds 6 days in April (1-9 birds) and 5 days in May (2-5 birds). Martha Vaughan and W. Hoffman observed an adult male at Clearwater Christian College 4 July, and Brooks Atherton found a flock of about 30 near the Pinellas County Resource Recovery Plant in mid-July.

The Brown-headed Cowbird is now beginning to appear in summer in adjacent Hillsborough County. A U. S. Fish and Wildlife Service Breeding-Bird Survey conducted in the western part of the county since 1966 recorded no cowbirds until 1985 when a displaying male was seen on 13 June near Odessa by G. Woolfenden and Manuel Lopez. The Tampa Summer Bird Count, which follows the rules of a Christmas Bird Count, has been conducted

since 1971. Cowbirds have been recorded two years only, 1983 and 1984, with a maximum of 3 individuals (*fide* William D. Courser). Finally, Jack Dozier observed a female cowbird in an industrial park in northwest Tampa, 12 July.

As a nest parasite, the Brown-headed Cowbird lays its eggs in the nests of other species of birds. Unfortunately, the host for the Pinellas County cowbird specimen is unknown, but eight species breed locally that are common hosts in southeastern United States (Friedmann 1929, Friedmann et al. 1977, Nolan 1978): Carolina Wren (*Thryothorus ludovicianus*), Blue-gray Gnatcatcher (*Polioptila caerulea*), White-eyed Vireo (*Vireo griseus*), Pine Warbler (*Dendroica pinus*), Prairie Warbler (*D. discolor*), Common Yellowthroat (*Geothlypis trichas*), Northern Cardinal (*Cardinalis cardinalis*), and Rufous-sided Towhee (*Pipilo erythrophthalmus*). Henry M. Stevenson reports to us the record of a White-eyed Vireo nest with one cowbird egg and three vireo eggs collected in Okaloosa Co., in June 1963. Certainly cowbirds will continue to increase and spread south in the peninsula. We urge field observers to search appropriate nests for eggs and young.

Cowbirds have contributed to population declines in Kirtland's Warblers (*Dendroica kirtlandii*) (Mayfield 1960) and perhaps Black-capped Vireos (*Vireo atricapillus*) (Williams 1983). Both are species with restricted ranges. Three species with restricted ranges in peninsular Florida soon may suffer similar fates, the Black-whiskered Vireo (*Vireo altiloquus*), and the Florida races of the Prairie Warbler (*D. discolor paludicola*) and Grasshopper Sparrow (*Ammodramus savannarum floridanus*).

Florida may become the meeting place for three parasitic cowbird species! The Bronzed Cowbird (*Molothrus aeneus*), which first was recorded in Florida in 1962 (Sprunt 1963), now is an annual visitor to the Tampa Bay area, and an irregular visitor south even to the Florida Keys. The Shiny Cowbird (*M. bonariensis*), which has been spreading rapidly through the Greater Antilles (Post and Wiley 1977, Wiley 1985), has just reached Florida. At this writing the first individual found in North America is frequenting a feeder in the Keys. Host preferences in Florida for these two species likely would be similar to those of the Brown-headed Cowbird, although the Shiny Cowbird's penchant for parasitizing *Agelaius* blackbirds in the Caribbean (Wiley 1985) suggests the Red-winged Blackbird (*A. phoeniceus*) as a potential target. We acknowledge with pleasure the assistance of Henry Stevenson in preparing this note.

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Wayne Hoffman and **Glen E. Woolfenden,** Department of Biology, University of South Florida, Tampa, Florida 33620.

Florida Field Naturalist 14: 18-20, 1986.

Longevity of a captive Blue Jay.—Clapp et al. (1983, J. Field Ornithol. 54: 133) listed the Blue Jay (*Cyanocitta cristata*) longevity record as 18 years-4 months for a recovered banded bird. Here I report on the longevity of a captive Blue Jay.

The nestling Blue Jay was found in Pitman, New Jersey in June 1958. Initially, the nestling was hand fed a mash diet made from milk, oatmeal, corn meal, bran, cut raisins, canned meat dog food, and crushed egg shells. When the jay could feed itself, it also was supplied with water, garden dirt, commercial bird seed and peanuts. During her early years, she occasionally laid infertile eggs. In January 1974 I brought the jay to Florida. As the jay advanced in age, she became blind and crippled and required hand feeding during the last year of her life. She died on 14 September 1984 at the age of 26 years-3 months.

I thank J. A. Rodgers, Jr. and D. S. Maehr for assistance in writing this note.—**Marion G. Coles**, 1809 El Ranch Dr., Sun City Center, Florida 33570.

Florida Field Naturalist 14: 20, 1986.

A Great Egret feeding on bread.—During five winter/spring visits to central Florida since 1971 I was able to study the birds on Lake Eola, Orange County very many times. The birds were tame and closely associated with visitors. Food of various kinds was strewn both to land and water birds, the main ingredients being peanuts and bread material. In April 1981, I made the unusual observation of Pied-billed Grebes (*Podilymbus podiceps*) taking bread from the surface of the lake in competition with other aquatic birds (King 1985, Fla. Field Nat. 13: 9). More recently, on the 16th January 1984, I observed a Great Egret (*Egretta alba*) at Lake Eola feeding along the water's edge. As it came to a small clump of reeds it bent forward to dip its head and long neck into the base of these and surprisingly, on three occasions, came out with small pieces of bread in the tip of its bill. Each time the food was held in this way; and, with neck stretched upward, it remained motionless for some fifteen seconds. Then, with a rapid head jerking movement the bread was swallowed.

I have not encountered the behavior in either Pied-billed Grebes or Great Egrets at Lake Eola, nor in any of the Ardeidae. Nevertheless, it may be of great interest for additional studies to be made where such associations exist, such as on similar lakes in Orange County and elsewhere.—**Bernard King** Gull Cry 9 Park Road, Newlyn, Penzance, Cornwall, England.

Florida Field Naturalist 14: 20, 1986.

Body-trembling in the Great Egret.—I observed an unusual feeding behavior of a Great Egret (*Egretta alba*) at Lake Eola, Orlando, Orange County, Florida between 19th December 1983 and 25th January 1984. It seemed to be the same bird each time and therefore could have been the one I found feeding on bread on 16th January 1984 at the same place (King, 1985 Fla. Field Nat. 13: 99).

The egret was extremely tame and thus allowed me to come within two or three meters without showing any degree of alarm, as it either fed along the water's edge or during roosting periods. By this close scrutiny I noticed when it was in high-expectation of obtaining some desireable food item, with its head and neck fully extended and body leaning forward, its whole body trembled or shivered momentarily. This was immediately followed by the egret plunging its bill into the shallow water to capture its prey. The body-trembling was so rapidly performed the phenomenon may easily have been missed by observers in the past.—**Bernard King** Gull Cry 9 Park Road, Newlyn, Penzance, TR18 5DZ, Cornwall, England.

Florida Field Naturalist 14: 21, 1986.

Renestings of American Crows in Florida and predation by raccoons.—I here report the repeated renestings of two cooperatively breeding (Kilham 1984) groups of American Crows (*Corvus brachyrhynchos*), A and B, observed in 1983, a year of excessive rainfall at the Hendrie ranch, 24 km south of Lake Placid, Highlands County, Florida. I have encountered no reports of repeated renestings of American Crows in Bent (1946), Good (1952) or other general accounts nor did I observe any in 4 of the 5 years (1981-85) that I followed crows at the ranch. Observations summarized in Figure 1 were aided by the tameness of the crows, a result of years of protection and the feeding of corn.

December 1982 was unusually warm and this may explain why female A was already incubating on 16 January 1983, the earliest of 16 nests I found in Florida. Incubation continued until 26 January when the nest failed for reasons unknown. Female A picked up sticks and showed other signs of renesting on the same morning. The crows of group A completed their second nest in 6 days, 3 days after the crows of group B completed their first one. These nests ended on 9 and 10 February when I found raccoons (*Procyon lotor*) sleeping in them. Both groups of crows renested, with the difference that while the B crows built a replacement nest, female A relaid in her second nest, 13 days after a raccoon had occupied it. This third attempt of the A crows failed on 4 March when I again found the nest occupied by a raccoon. The B crows had already lost their second nest 8 days before. In spite of these differences in dates, groups A and B completed new nests within 2 days of each other. These nestings, the third for group B and the fourth for group A, were successful to the extent that both contained nestlings 12-15 days old on 15 April. On 16 April nest B, which was poorly placed, developed a tilt and the nestlings fell to the ground.

American crows as observed at the ranch have nested in what are usually dry months of January to May, as shown in Figure 1 for 1985, a representative year. The winter of 1983 (the year of the El Niño event), in contrast, was unusual with its heavy rains and flooding. It was also unique among the crows at the ranch, in my 5 years of observations, in the extent of nest loss and replacement. In a somewhat parallel situation, Lawton et al (1985) noted the greatest variability in the breeding behavior of Brown Jays (*Cyanocorax morio*), in Costa Rica, in a year of unseasonal Atlantic storms.

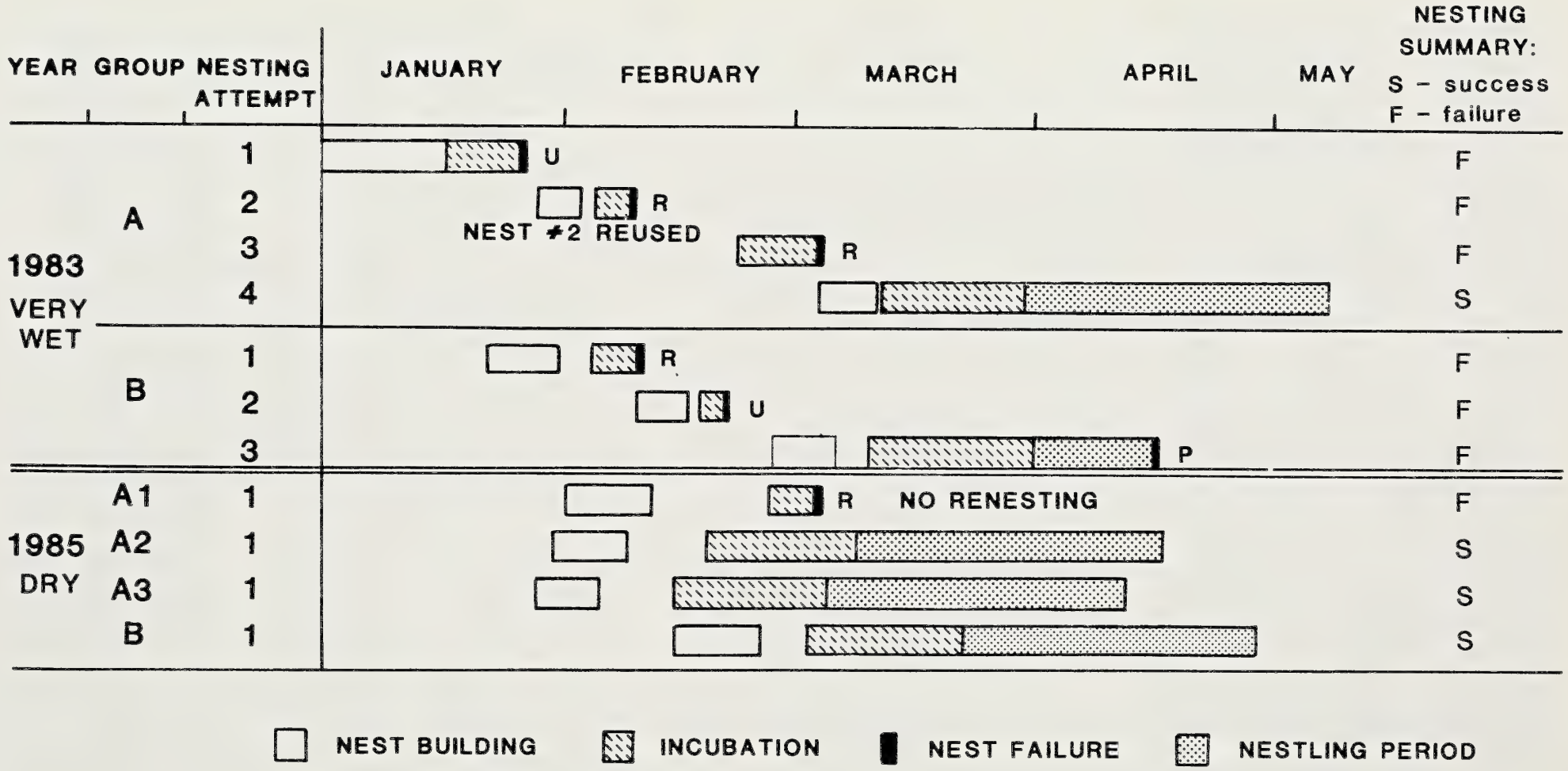

Figure 1. Results of repeated nesting attempts of two cooperatively breeding groups of crows, A and B, that had contiguous territories in the very wet year of 1983, and of A1, A2, A3 and B that nested in the same area in 1985, a dry year. Causes of the 7 nest failures in the 2 years were: R = raccoon (n = 4); U = unknown (n = 2); and P = nest poorly constructed (n = 1).

Three out of the six nest failures that led to renestings of crows in Florida in 1983 (Fig. 1) were due to raccoons. The widespread flooding dispersed these animals, leading, seemingly, to their finding crow nests more readily. In 1985, an unusually dry year, the only nest that failed was one taken over by a raccoon, the nest tree being the only one of four used by crows in that year that was growing in a wet place. Hearing a sudden cawing of crows on 1 March, the third day of incubation, I walked over to find the raccoon climbing the nest tree. The four crows of the group perched about the nest and two swooped at the predator that, seemingly undisturbed, came over the nest rim and, with head down for some minutes, appeared to be eating the eggs. The crows left after a minute and did not return. The raccoon curled up in the nest where, as with the three earlier nests I had noted, it was barely visible from the ground. These observations suggest that raccoons may be one of the commoner and more effective predators of crows's nests in Florida. Crows at the ranch appeared to have little protection against them other than placing their nests away from wet places.

Emlen (1942) found that American Crows sometimes relaid in 10-12 days in nests from which he had taken clutches and Butler et al (1984) in 13.6 days for nests of Northwestern Crows (*C. caurinus*) that had been abandoned or predated. Wittenberg (1968) noted Carrion Crows (*C. corone*) relaying in the same nest after failure in 6 of 76 first and in 5 of 16 second nestings. He did not observe any crows attempting to nest as many as four times in a year as I did in Florida.

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Lawrence Kilham, Box 37, Main St., Lyme, New Hampshire, 03768.

Florida Field Naturalist 14: 21-23, 1986.

FLORIDA ORNITHOLOGICAL SOCIETY
SPECIAL PUBLICATIONS

Species index to Florida bird records in Audubon Field Notes and American Birds volumes 1-30 1947-1976, by Margaret C. Bowman. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00.

The Carolina Parakeet in Florida, by Daniel McKinley. 1985. Florida Ornithological Society, Special Publication No. 2. Price $6.00.

Order prepaid from the Treasurer

REVIEWS

The birds of the wetlands.—James Hancock. 1984. New York, Facts on File Publications, 152 pp. including 112 pp. with color photographs. $22.95.—Here is a "magic carpet" to major wetlands of the world. The first "touchdown" is to the "most important wetlands park in the world", Florida's Everglades. Swamps of Argentina are next reconnoitered. Now cross the South Atlantic to Kenya's Tana River. At Bharatpur the "most spectacular heronry in Asia" awaits us. Chinese boatmen will paddle us along canals of Zhalong (in that part of this country formerly called Manchuria). Then, after visits in Japan, Indonesia and Australia, we take leave of our "carpet" at Spain's Coto Doñana.

Field glasses aren't needed. Linger instead over the many pages of the author's artistic, beautifully reproduced photographs. What *painted* illustrations have paid homage to Roseate and Asiatic Spoonbills, to Campos Flickers, Saddlebacked Storks, Crowned Cranes and Mandarin Ducks as have these photographs?

A travelogue (the text) gives much about the humans in the recent history of each wetland. Maharajahs, imperial households, kings, dukes, ornithologists of the past and even cultural revolutions come alive as each plays its role in a wetland's background. For each wetland species lists are given and there are careful instructions for travel (by conventional means) to each. Even the clothes and gear one should bring are suggested.

Each wetland has unique political and ecological problems and the topic of preservation of these areas is emphasized. One cannot escape great concern for the survival of these magnificent ecosystems. Indeed, one wonders whether or not our burgeoning civilization will be able to maintain viable room for wild species. What *would* the world be "once bereft of wet and wilderness?"

At the second edition of this delightful book, I hope that the publishers will have been convinced not to "split" elegant photographs between pages. Who can but shudder at, e.g., the White-naped Crane (pp. 70-71) and the Wood Sandpiper (pp. 102-103) with their "dislocated" necks and bills! There are a few minor errors to set aright: e.g., Daniel Board (p. 17) was really Daniel Beard and *Sterna albifrons* (p. 28) does not stay in Florida "all the year round." It would be helpful to have a larger scale map for each wetland's locality. And this reviewer really craved additional landscape pictures.

Thanks, James Hancock, for a fine journey. To all who enjoy the wetlands with their citizens of many taxa, I recommend your "carpet". Most who ride it will, I'll guess, come aboard again and again—as will I.—**Oscar T. Owre**, Department of Biology, University of Miami, Coral Gables, Florida 33124.

Florida Field Naturalist 14: 24, 1986.

Voices of the New World jays, crows, and their allies. Family Corvidae.—John William Hardy. 1983. Gainesville, ARA Records. 33 1/3 record album and 8-page insert booklet.—This is another in the series of monograph-style albums of recordings of bird families from ARA Records. Included are representative calls from 48 species of New World corvids (following the classification of Hardy, not the A.O.U.). Only one species is missing, the Azure-naped Jay (*Cyanocorax heilprini*), and apparently no recordings of this species exist. Although not technically a New World corvid, the Hawaiian Crow (*Corvus tropicus*) is included because Hawaii is part of the United States. The booklet gives localities and dates for each of the recordings, as well as comments on some species.

Corvids prove a problem for an effort such as this. Most songbirds have a loud song, generally associated with breeding and territoriality, by which we might know them. Corvids do not have such songs but rather possess a large repertoire of calls and assorted noises which they use in a variety of contexts. As a result, often no one call exists that would best typify the species for all people. Indeed, the vocal repertoire of some jay species appears to be unlimited. Because of this fact, no species is represented by its entire range of sounds, and Hardy admits that the representation of the species is uneven. (We might have hoped for more than one predator scold from our own Florida Scrub Jay, but perhaps my personal bias is showing here.) However, for most species the calls presented are the ones most likely to be encountered, and the ones most likely, when played on a tape recorder, to "provoke nearby jays to answer and approach so that the observer can see the birds." The examples provided, the only known recordings for some species, give an interesting view of this family. One readily gained conclusion is that all of the jays, with one possible exception, sound very "jaylike". For confirmed corvid fanciers, like Dr. Hardy and myself, the opportunity to be exposed to an aspect of the biology of such a large cross section of the family is a most welcome one.—**Kevin J. McGowan,** Department of Biology, University of South Florida, Tampa, Florida 33620.

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The editors of the Florida Field Naturalist welcome submission of articles and notes containing the results of biological field studies, distributional records, and natural history observations of vertebrates, especially birds. Its geographic area includes Florida, adjacent states, the Bahamas, and nearby West Indies.

A manuscript submitted for consideration should be sent to the Editor at the address on the cover of a recent issue. When preparing a manuscript, authors should carefully follow the style requirements presented below and illustrated in recent issues of the journal. In that each manuscript is reviewed by several technical authorities who advise the editor on its style, contents, contribution to ornithogical knowledge, and acceptability for publication, an author should submit three copies of the manuscript to the editor.

The Florida Field Naturalist follows the conventions set forth in the CBE Style Manual, 1983, available from the Council of Biology Editors, Inc., 9650 Rockville Pike, Bethseda, Maryland 20814. An author can also consult the format and style of the most recent issue of the journal.

Articles are contributions of six to twenty-five typed pages. For publication of longer articles, payment of page charges may be necessary. Articles should be divided into several sections. An Abstract should recapitulate the basic findings and interpretations and should be able to stand alone in describing the results of the paper. An introduction should describe the study and its contribution to knowledge. A Methods sections should include a description of how the study or observations were accomplished including references to any statistics or unusual nomenclature used. If appropriate, a Study Area section should provide a description of the site of the investigation or observations. The Results section should be a concise presentation of the findings of the study, using tables, figures, and statistical analysis where appropriate. The Discussion should relate the findings to previous knowledge and elaborate on their importance. In an Acknowledgements section, the author should recognize the contributions of co-workers, the help of reviewers of the manuscript, and any financial support for the study. A Literature Cited section lists all references cited in the text of the paper.

Notes are contributions of fewer than six typed pages. Such manuscripts should follow the outline given above but the sections need not be labeled. Notes do not have an abstract, but must conclude with a summary paragraph.

Care in preparation of a manuscript is essential. Type on one side of 8½ x 11 inch white paper. Do not use erasable bond because it will smear or paper with the lines numbered or borders of the text space lined. It is essential to leave space for editorial comments,

alterations to text, and instructions to the printer. Therefore type everything double space, including titles, addresses, literature cited, and tables. Also leave at least one inch margin all around. Do not hyphenate words on line endings. Avoid footnotes. Type tables on separate sheets, using space efficiently. Diagrams, charts, and line drawing must be of professional quality. This can be accomplished by using black India ink and drawing guides. Use transfer lettering, which can be purchased in stationery stores, or mechanical lettering guides. Choose a bold, clear lettering style such as Helvetica Medium. When the figure is reduced, the letters should be no smaller than 1 mm, so chose lettering size accordingly. Consult recent issues of the journal, or other ornithological journals, for ideas on composition of tables and figures. The submission of photographs pertinent to the paper is encouraged, although no fees can be paid. They should be glossy black and white prints of high contrast and sharpness and about the same size as they will appear in print, either 4 x 3 inches or either 4 x 6 inches. Such prints can be made from high quality color slides, and an author should consult a photography store about having photographs printed for publication. Further information on scientific illustration may be found in a pamphlet by A. Allen, Steps Toward Better Scientific Illustrations, available from Allen Press, Lawrence, Kansas 66044.

Use of the literature requires special care. All literature cited must be verified by examination of the original reference, or the lack of such verification must be noted. If more than five references are cited they should be listed alphabetically in a Literature Cited section. Format follows the CBE style manual, 1983, with the date placed after the author's name. Abbreviate journal names according to the BIOSIS List of Serials (BioSciences Information Service, 2100 Arch Street, Philadelphia, Pennsylvania 19103), or consult recent issues of the Florida Field Naturalist, If there are five or fewer references, give a shortened citation only in the text on its first use, e.g. "(Howell 1932, Florida bird life, New York: Coward-McCann)" for books or "(Kilham 1984, Fla. Field Nat. 12:25-31)" for journal articles. Otherwise cite references in text as part of the sentence, e.g. "Howell (1932) stated that . . .," or parenthetically, e.g. "(Howell 1932)." Cite two authors in text as "(Robertson and Kushlan 1974)"; cite more than two authors in text as "(Sykes et al. 1984." Pay special attention to crediting observations reported in Regional Reports in American Birds. Where such information is available, cite the observer in text or tables in addition to the Regional Editor, e.g., "(F. Moore *in* Stevenson 1973)" or "(many observers *in* Stevenson 1973)."

Express all measurements in units of the SI Système International d'Unités). These units are weight in gram (g) or kilogram (kg), length in metre (m), or kilometre (km), time in second (s), area in square metre (m^2) or hectare (ha), speed in metre per second (ms^{-1}), energy in joule (J), and power in watt (W). See a dictionary for conversion factors. If desired in addition, the equivalent value in the English system may be provided parenthetically. Use abbreviations for measurement units in text when they follow a quantity (2 km, 12 ha, 90 s). Unless they are followed by such a measurement unit, spell out numbers less than ten, e.g. six birds but 6 m. Use the 24-hour time system and the military date system. That is, use "0306 of 13 November 1984" for 3:06 A.M., November 13, 1984 and use "1600 of 1 May 1980" for 4 P.M., May 1, 1980.

In naming organisms follow standard taxonomic works for each group. Capitalize the common names of birds, and follow The AOU Check-list of North American Birds, sixth edition, 1983, and subsequent supplements for scientific names. Do not capitalize the common names of other vertebrates or plants. For reptiles and amphibians use Collins et al., 1982, Standard Common and Current Scientific Names for North American Amphibians and Reptiles, second edition, Society for the Study of Amphibians and Reptiles Herpetological Circular 12. For fishes use Robins et al., 1980, A list of Common and Scientific and Common Names of Fishes from the United States and Canada, fourth edition, American Fisheries Society Special Publication 12. For other animals and plants cite the sources used for common and scientific names in the Methods section. Five the scientific name of each organism, underlined and in parentheses, when it is first mentioned in text or in a table. Thereafter use common names if possible.

The Florida Field Naturalist encourages the submission of reports on the changing distribution and occurrence of rare species in its geographic area. All sight records of occurrences of birds in Florida submitted for publication are reviewed for acceptability by the Records Committee of the Florida Ornithological Society. Prior or simultaneous submission of a record to the committee on its standard form will decrease the time and expense required to consider it for publication. Notices of a record in American Birds, newsletters, or Records Committee reports do not preclude submission of a paper with additional details to the Florida Field Naturalist, but previous notices should be cited. All reports must contain the time, place (including county), circumstances, and documentation of the observation sufficient to assure proper identification was made. Specimens and photographs should be deposited in a scientific collection. Give their accession numbers in text. The Florida State Museum is the official depository of specimens, slides, or tapes for the Florida Ornithological Society. Citations of other pertinent records, a summary of overall status of the species, and a discussion of relevant biological factors should be part of most reports. Distribution notes are encouraged from observers who have not previously written such reports. If presubmission assistance with distribution notes is desired, contact the Associate Editor (for distribution reports), who will provide advice on the desirability of submission, information needed, format of presentation, and composition of the note prior to its submission for the editor's consideration.

The Florida Field Naturalist especially encourages submission of behavioral notes and the results of scientific field studies. Notes on behavior need not be the first published report but should take into consideration previously published information. Consideration should also be given to interpreting the biological, ecological, or evolutionary significance of the behavior reported. Field studies must conform to standard scientific criteria for study design, analysis, and interpretation. Hypotheses should be clearly stated and data should be subjected to statistical testing where appropriate. Presubmission advice on the writing of scientific studies can be sought from the Associate Editor (for technical reports).

The Florida Field Naturalist presents reviews of books, monographs, and other material of interest to its readers. Materials to be considered for review should be sent to the Associate Editor (for reviews). Unsolicited reviews may also be submitted to the Associate Editor (for reviews). An annotated list of scientific articles referring to Florida birds is published annually. Authors wishing to have papers included in this feature should send reprints to the Special Editor of this feature.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 14, NO. 2 MAY 1986 PAGES 29-52

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The Florida Field Naturalist is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 14, NO. 2 MAY 1986 PAGES 29-52

PRODUCTIVITY AND CHANGES IN NEST UTILIZATION IN FOUR CENTRAL FLORIDA BALD EAGLE NESTING TERRITORIES

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Abstract.—Four nesting territories of the Southern Bald Eagle (*Haliaeetus leucocephalus leucocephalus*) in central Florida were monitored to record productivity and changes in nest utilization. A total of 316 hours of observation was carried out during breeding seasons between 1978 and 1984. At the four nesting territories, annual productivity averaged 1.69 young per successful nest, a rate comparable to average productivity in Florida over the same years. More than one nest was present in each eagle territory and, at three of the four territories, a second nest was used when the tree supporting the first nest was destroyed by severe weather. Buffer zones may prevent disruption of eagle nesting and protection of alternate nest trees is desirable.

Nesting success of the Bald Eagle in Florida has been studied since the 1940's. A decline in eagle productivity in southwest Florida was documented by Broley (1958) when he found a 41 percent reduction in active eagle nests from 1946 to 1957. The Office of Endangered Species and International Activities (1973) assigned the Southern Bald Eagle to endangered species status in 1965 when the total nesting population throughout its range was estimated to be about 235 active pairs.

Since then, efforts have been made to halt the decline in eagle numbers, and annual surveys of the Florida population have been coordinated through the Florida Cooperative Bald Eagle Survey Committee organized in the fall of 1972 (Nesbitt et al. 1975). Survey results during 1978-1983 show an annual average of 351 active territories and 220 successful nests in Florida (Nesbitt pers. comm.). It is not known

if eagle productivity has actually increased in recent years or if, with the increased efficiency of annual surveys, more active eagle territories have been discovered. However, the decline in hatching success formerly associated with pesticides that caused eggshell thinning now seems less of a problem. Probably survival and recovery of Florida Bald Eagle populations are primarily dependent upon availability of suitable nesting and feeding habitats.

In Florida, eagles begin nesting activities in the fall and females may begin egg laying by late October (Nesbitt et al. 1975); active nests with eggs may be found as late as early March (Nesbitt et al. 1975). Most young fledge the nest by April. Eagles commonly nest in tall pine or cypress trees within 3 km of water (McEwan and Hirth 1979). Because Bald Eagles often use alternate nests in different years, inactive nest trees receive the same protection as active nests (U. S. Fish and Wildlife Service 1982. Management guidelines for the Bald Eagle in the southeast region, Unpbl. Rpt., Jacksonville, Florida: U. S. Fish and Wildlife Service).

In this paper we document productivity and nest utilization in four Bald Eagle nesting territories in central Florida.

Methods

Four nesting territories were studied in areas adjacent to electric generation or transmission facilities in central Florida (Fig. 1). Sites were located between 80°35′ and 81°40′ W longitude, 27°5′ and 29°15′ N latitude.

The Martin County territory included a 160 ha tract of cypress surrounded on three sides by a power plant cooling reservoir and on the fourth side by a canal and railroad. A pasture adjacent to the canal and across from the cypress stand is included in the site considered. The area is approximately 4 km from a power plant (Wilcox 1979, pp 451-464, Rocky Mountain Forest and Range Exp. St. Gen. Tech. Rpt. RM-65). This nesting territory was monitored during the breeding seasons of 1978 through 1984.

The Sanford territory located in Volusia County includes scattered clumps of pines adjacent to a 240 kV transmission corridor and about 1000 m from power plant stacks. This area is close to the plant's cooling reservoir, near an active railroad line, and within hearing distance of a state highway and air traffic from the Orlando Airport. The Sanford nesting territory has been observed from 1978 through 1984 excluding the 1982-1983 breeding season.

Located in Orange County, the Poinsett territory includes a wet flatwoods bordered on two sides by a state road and a 240 kV transmission corridor. It is about 500 m from a 500 kV substation (under construction 1981-1984) and approximately 3 to 4 km from the St. Johns River. Clearing activities at the substation site were timed to avoid disruption to the nesting period. This territory has been studied during breeding seasons from 1981 through 1984.

The Volusia County territory includes scattered pines located 90 to 100 m from the St. Johns River. Several campsites are within 150 m of the nest tree but no major roads are in the vicinity. The nest is approximately 280 m from a 500 kV transmission line corridor

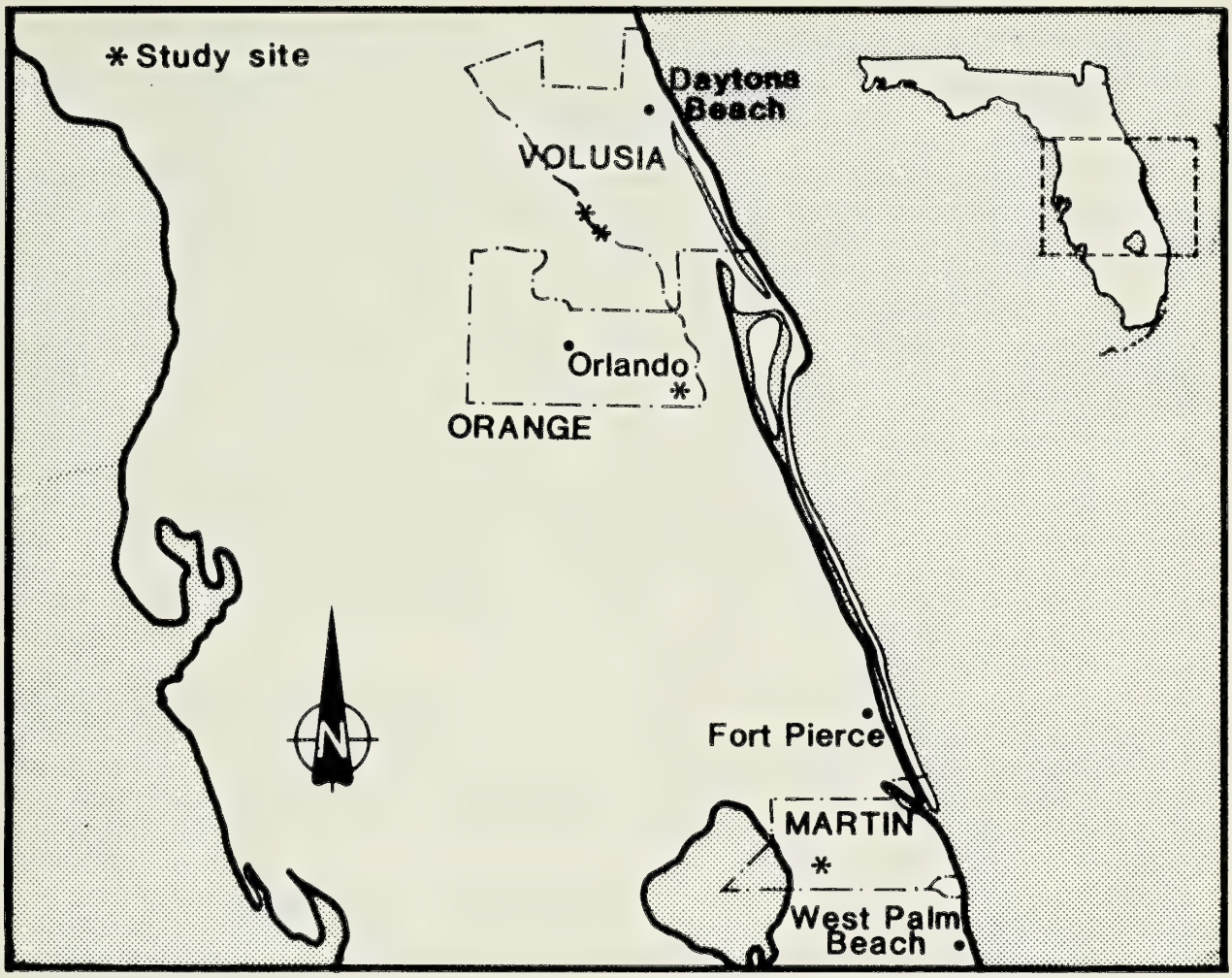

Figure 1. Bald Eagle nesting territory study sites.

(under construction 1983-1984). Clearing and construction activities in the corridor were timed to avoid disruption to the nesting period. This territory was studied only during the 1983-1984 nesting season.

Monthly observations were initiated at each site in October and continued until young were observed or it was determined that nesting had been unsuccessful. A successful nest was one which fledged one or more young. If young were present, observations generally were increased to once every two weeks until all were fledged. Observations were made from the ground with the aid of binoculars and a 60X spotting scope mounted on a tripod. The onset of incubation, probable hatch date and probable date of fledging were noted during regular observations. Because observations were made once every two to four weeks, dates are approximate.

A total of 137 visits (316 hours of observation) was made to the study sites. At Martin County, 29 observation visits (146 hours) were made over six years. At the Sanford nesting territory, 52 visits (78 hours) were made over five years. At the Poinsett sit, 38 visits (70 hours) were carried out over three years and at Volusia County, 18 visits (22 hours) were made primarily during one breeding season.

Results

Productivity.—At the study nesting territories, an annual average of 1.69 young Bald Eagles was produced per successful nest (Table 1). The annual average number of young fledged per successful nest ranged from 1.00 in 1981-1982 to 2.00 in 1978-1979, 1980-1981 and 1982-1983. Florida Bald Eagle survey results showed that the annual average number of young per successful nest ranged from 1.42 to 1.63 and averaged 1.51 during the years 1978 through 1984 in Florida (Nesbitt 1983, Nesbitt pers. comm.). Productivity at the study sites met or exceeded average productivity in Florida. Data for the study sites were compared to the statewide productivity data and showed no significant difference in productivity (Mann-Whitney $p<.05$). It should be noted that the number of eagle pairs monitored in this study represented only 1.5 percent of the total monitored statewide.

At the Martin nesting territory (the southernmost site) incubation did not begin before early January and young fledged between early March and late June (Table 2). The nesting period spanning 10 weeks in 1980-1981 probably indicated failure of the first nesting attempt followed by a successful second attempt.

At the Sanford nesting territory, incubation was initiated between mid-December and late January. Fledging occurred between late April and late May. The nesting periods observed for 6 consecutive years at this site were more consistent from one year to the next than they were at any of the other study territories (Table 2).

Incubation began between mid-December and mid-February at the Poinsett nesting territory (Table 2). Fledging occurred between late March and early June. The latest onset of incubation took place in February 1984 when the former nest tree was destroyed by high winds in mid-January 1984.

The Volusia nesting territory was visited once in late March 1983 after the nest was reported to have been active earlier in 1983 (P. Simpson pers. comm.). No eagles were observed in March, but two major sections of an eggshell were found under the nest. The eggshell was relatively fresh with membranes attached to the shell. The annual Florida nesting survey recorded that this nest had been active, but no young were fledged (Nesbitt pers. comm.). Because no feces or food items were present under the tree, it appeared to us that the nest had been abandoned for several weeks prior to our observations in late March. When observations were resumed the following breeding season, nesting activity at Volusia spanned the period from mid-December 1983 through mid-June 1984 (Table 2). As occurred in 1980-1981 at the Martin site, this unusually long period indicates an early unsuccessful attempt.

Table 1. Productivity at Four Florida Bald Eagle Nesting Territories Compared to Average Productivity During Study Years, 1978-1984.

Year	Number of successful nests[1]	Number of young produced	Young per successful nest	Florida average young/ successful nest[2]
1978-1979	2	4	2.00	1.45
1979-1980	3	5	1.67	1.63
1980-1981	3	6	2.00	1.57
1981-1982	2	2	1.00	1.48
1982-1983	2	4	2.00	1.52
1983-1984	4	6	1.50	1.42
Average annual productivity			1.69	1.51

[1]Includes data for the Poinsett site supplied by Nesbitt 1981, pers. comm.
[2]From Nesbitt 1983 and Nesbitt 1984, pers. comm.

Nest utilization.—In each of the four territories studied, the original nest was destroyed by storm or human activity, but an alternate nest was available or built. As an example, the large eagle nest (MC-1) located in a dense cypress stand at the Martin nesting territory was used from 1976 through 1978. Records show that the nest was successful during both of these breeding seasons (Wilcox 1979). During Hurricane David on 3 September 1979, this tall bald cypress (*Taxodium distichum*) nest tree was blown down and the nest material scattered over the ground. A second but smaller nest (MC-2) was discovered on 13 March 1980 in a cypress tree approximately 120 m west of a canal adjacent to the cypress stand. Because of its proximity to the former nest, the same feeding areas were available to the eagle pair. Nest MC-2 was used for three breeding seasons from spring 1980 through 1982. On 3 March 1983, two adults and two chicks were observed in a new nest (MC-3) located in a dead cypress adjacent to the former nest MC-1. Nest MC-3 was used successfully during 1983 and 1984. The tree containing canal nest MC-2 was cut down by the landowner in the spring of 1983.

At the Sanford nesting territory, the original nest (SF-1) was located in a longleaf pine (*Pinus palustris*). Eagles nested there successfully from 1978 through March 1982 (Table 2). On 8 April 1982, strong winds blew down pine trees adjacent to the nest tree and destroyed nest SF-1. One eagle chick approximately four to five weeks old was found dead on the ground near the remains of the former nest. A necropsy report stated that the bird died from exposure, possibly drowning, and trauma (National Wildlife Health Laboratory 1982, Unpubl. Necropsy Report on Bald Eagle accession number 29,703). Both adults were unharmed. Ob-

Table 2. Summary of Breeding Behavior and Nest Utilization at Four Central Florida Nesting Territories, 1978-1984.

Nesting Territory	Breeding Season	Incubation Beginning	Probable Hatch Date	Number Young	Number Fledged	Probable Date of Fledging
Martin	1978-1979	—	—	0	0	—
	1979-1980	—	1st week of March 1980	2	2	3rd week of April 1980
	1980-1981	Early Feb 1981	1st week of April 1981	2	2	Late June 1981
	1981-1982	Early Jan 1982	February 1982	–	1	Early March 1982
	1982-1983	—	Early Feb 1983	2	2	—(before late April 1983)
	1983-1984	—	Early April 1984	2	1	—
Sanford	1978-1979	—	Early March 1979	2	2	4th week of May 1979
	1979-1980	Mid-Jan 1980	1st week of March 1980	2	2	Mid-May 1980
	1980-1981	Early Jan 1981	1st week of March 1981	2	2	Mid-May 1981
	1981-1982	4th week Jan 1982	Early March 1982	1	0	—
	1982-1983	—	—	—	0	—
	1983-1984	Mid-Dec 1983	4th week in February 1984	1	1	4th week in April 1984
Poinsett	1978-1979				2[1]	
	1979-1980				1	
	1980-1981				2	
	1981-1982	Early Jan 1982	Early March 1982	2	1	Late April 1982
	1982-1983	Mid-Dec 1982	Mid-January 1983	2	2	Late March 1983
	1983-1984	Mid-Feb 1984 or earlier	Early March 1984	2	2	Early June 1984
Volusia	1981-1982	—	—	—	0[1]	—
	1982-1983	—	—	—	0	—
	1983-1984	Mid-Dec 1983	2nd week of March 1984	2	2	Mid-June 1984

[1]Nesting data supplied by Nesbitt 1984, pers. comm.

servations were resumed on 23 September 1983 when a relatively small nest (SF-2) was identified about 870 m north of the former nest. Nest SF-2 was located in a slash pine (*Pinus elliottii*) that was one of the tallest trees in the area. In late April 1984, one eagle successfully fledged this nest.

The Poinsett nest tree in use when observations were initiated in October 1981 was the tallest tree in the immediate area. The bald eagle nest (PO-1) was in a slash pine just southeast of a shallow seasonal pond. Nest PO-1 was used successfully for the first breeding season, 1981-1982. When observations were resumed in the fall of 1982, eagles were nesting in a slash pine tree (PO-2) located only 40 m west of the first nest. In the fall of 1983 the nest PO-2 support tree died, probably as a result of a lightning strike. High winds during two days in early January apparently broke off the top of the tree, destroying nest PO-2. Observations on 14 February 1984 noted an adult eagle in incubating posture on the original nest PO-1.

The Volusia nesting territory contained only one active nest that was used during 1983-1984. The nest (VO-1) was located in a longleaf pine about 90-100 m from the St. Johns River. The presence of an eagle eggshell found under the nest in late March 1983 showed that the nest was active during the 1982-1983 breeding season. A second smaller nest (VO-2) was identified on 18 January 1984 in a living pine tree located approximately 120 m northwest of the active nest. Adult eagles from nest VO-1 frequently perched on this nest, but no incubation occurred there.

Discussion

Eagle productivity (per successful nest) at the study nesting territories met or exceeded average productivity in Florida during the same years and was not statistically different from statewide productivity. Bald Eagle nesting was characterized by variability in the onset of nesting and duration of the breeding season and second nesting attempts when the first failed. Of the many factors affecting nesting success, three were documented: 1) impacts from storms; 2) importance of access to suitable nest trees; and 3) freedom from human disturbance.

Eagles select nest trees that generally are the tallest, oldest trees located in the open or on the edge of a stand of trees (McEwan and Hirth 1979). Trees and nests built in the upper branches of these trees are particularly susceptible to damage from hurricanes, lightning and high winds associated with severe weather. Of the nine nests observed, three were destroyed by storms, and in one instance, an eaglet was killed.

Because nest trees are vulnerable, trees meeting the conditions of height and location need to be available as alternates in the event that one nest tree is destroyed. An unoccupied nest may not represent an abandoned territory but may be an alternate nesting site within an active territory (Postupalsky 1974). In some cases, a pair of eagles has been observed to use nests as far as 3 km apart (Howell and Heinzman 1967). In our study, the maximum distance between alternate nests was approximately 1 km. The presence of suitable alternate nest trees insures that an eagle pair will have a site to rebuild the nest and retain access to the same feeding areas even if its original nest tree is destroyed.

The third factor important to nesting success is freedom from short-term and long-term human activities disruptive to eagle nesting behavior and especially alteration of habitat. Management guidelines for the protection of eagles in the southeast region have been issued by the U. S. Fish and Wildlife Service (1982). The guidelines recognize that all nests used by any pair of eagles are to receive the same protection even though a nest may not have been used for raising young for one or more years. Restrictions are recommended in Florida for a primary zone of a radius 0-227 m (0-750 ft) from the nest tree as well as for a secondary zone of 228-457 m (751-1500 ft) radius from the nest tree. In the primary zone, habitat alteration such as logging, industrial development and mining are discouraged. The recommendations for restriction do not have the force of law but are management guidelines. Restrictions of human activities also are recommended for each zone, and the particular vulnerability of eagles to disturbance during courtship, egg laying, incubation and brooding are recognized.

The eagles observed in this study successfully fledged young within 0.05-4 km of human activity and operation of equipment associated with the generation and transmission of electricity. At the Volusia site, land clearing for a transmission line located approximately 280 m from the nest tree was conducted before the breeding season. Setting foundations for transmission towers and stringing of lines were scheduled after the young had fledged. Clearing and filling operations for the Poinsett Substation fewer than 50 m outside of the secondary zone were conducted before the onset of the breeding season. Thus, in these two instances, management guidelines were adhered to and eagles continued to use these two nesting territories.

It has been our experience that eagles vary in the amount and kinds of human activities they will tolerate. The eagles observed in this study selected nest sites within sight and hearing of human activities; for these pairs it appears that the recommended buffer zones were sufficiently

large. From this study we cannot predict whether eagles presently nesting in isolated areas would tolerate human activity even at a distance of 457 m. Nevertheless, protection of alternate as well as occupied nest trees and restriction of disruptive activities during the breeding season are important factors that will increase the probability of nesting success for individual eagles.

Acknowledgments

This research was funded by the Florida Power and Light Company.

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METAL RESIDUES IN BAT COLONIES, JACKSON COUNTY, FLORIDA, 1981-1983

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Abstract.—From 1970 to 1982 metals escaped from a battery salvage plant at Steel City, Jackson County, Florida. Chemical analyses of bat guano showed that cadmium was elevated at two nearby caves and at one more distant cave used by both endangered gray bats and southeastern bats. Further chemical analyses showed that cadmium was elevated in livers (2.4 times) and kidneys (3.3 times) of southeastern bats from nearby Judges Cave relative to southeastern bats from a Gainesville roost. The maximum concentration in kidneys from the Judges Cave colony (2.9 ppm) was less than minimum concentrations (3.41, 8.5, and 44 ppm) associated with various harmful effects in other mammalian species. We conclude that the bat populations have not been harmed by metal pollution.

Since 1970, wastes containing heavy metals have been escaping from a battery salvage plant at Steel City, Jackson County, Florida (Fig. 1). The plant ceased operations in January 1980, but pollutants continued to escape from the property for two more years. Heavy metals were thought to have contaminated Little Dry Creek and possibly portions of the Chipola River (Fig. 1). Damage to vegetation, fish, and shellfish has been described (Lynch 1981, Becker 1981). Concern developed for major colonies of the endangered gray bat (*Myotis grisescens*) and the southeastern bat (*M. austroriparius*) at Judges and Geromes Caves (Fig. 1) because these bats feed, in part, on insects whose larvae develop in the Chipola River. Geromes Cave is surrounded by peanut fields and pesticide contamination also seemed possible. Estimates of bat numbers at Geromes Cave declined between 1970 and 1981 (Wenner 1984). Our objective was to measure and evaluate contaminant levels in these bat colonies.

METHODS

Chemical analysis of a single guano sample from beneath a bat colony can provide an accurate indication of the pesticide contamination of the bats that deposited it (Clark et al. 1982). Other data at hand show a similar correspondence for lead. We have assumed the same is true for zinc and cadmium. On 22 October 1981, one of us (ASW) collected one guano sample each from Judges and Geromes Caves. A third location, Sneads Cave (Fig.

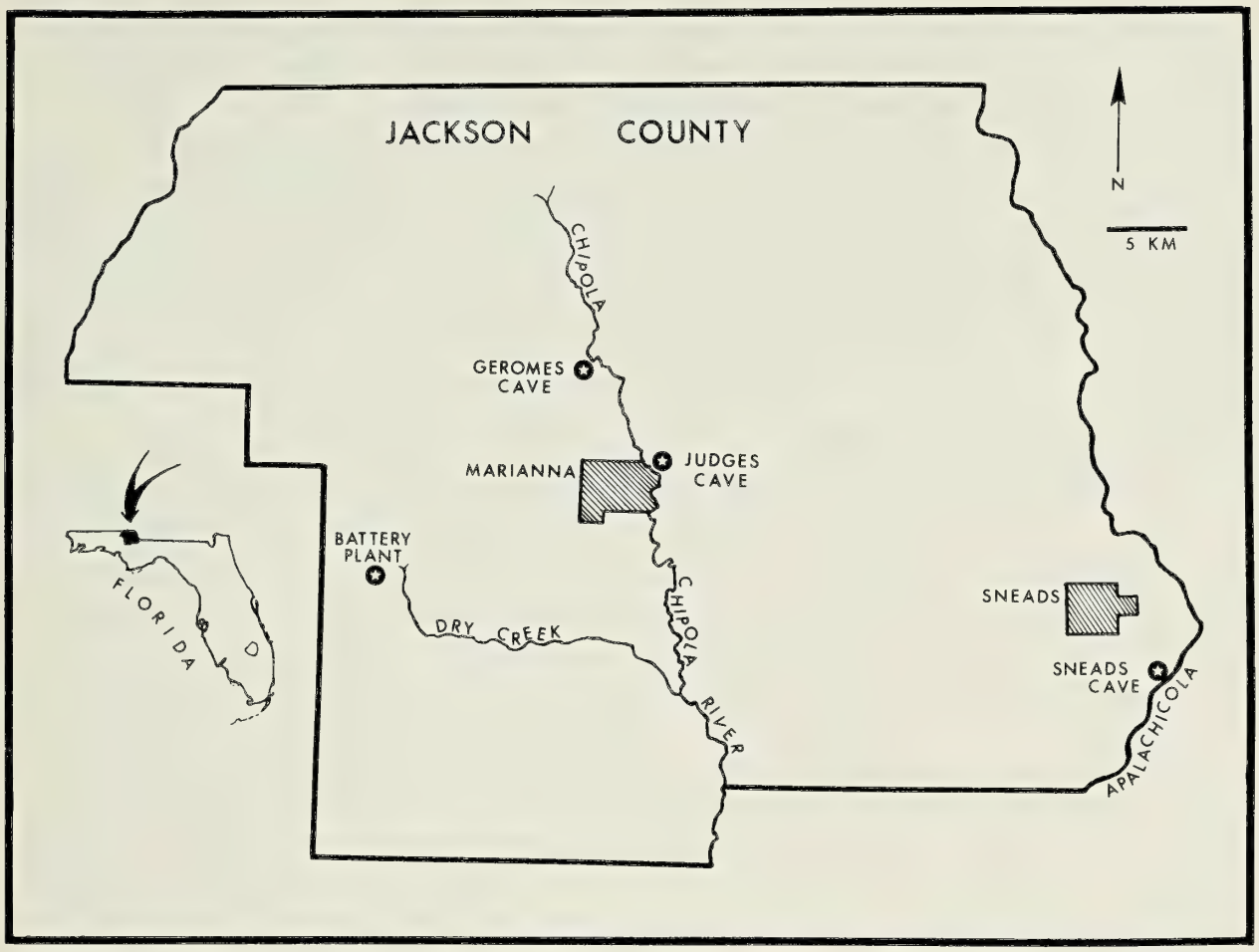

Figure 1. Locations of collection sites and battery salvage plant in Jackson County, Florida

1), was also sampled the same day as a "control" because its location is more distant from the metal contamination. Because Sneads Cave is surrounded by intensive agriculture, we also checked for possible exposure of the bats to pesticides. These guano samples, which may represent either species, or both, were analyzed at the Patuxent Wildlife Research Center for organochlorine pesticides and PCB's (polychlorinated biphenyls) and for lead, chromium, zinc, and cadmium. Because these results indicated that Sneads Cave did not have lower levels of metal contamination than Judges and Geromes Caves and thus might not be a suitable control site, a sample of big brown bat (*Eptesicus fuscus*) guano was collected at Patuxent in May 1982 and analyzed for lead, chromium, zinc, and cadmium. We have assumed that metal levels in guano from big brown bats not exposed to pollution sources would be similar to levels in the Florida samples if the Florida bats were also not exposed.

Comparisons of the samples suggested that three of the four metals (chromium, zinc, and cadmium) were elevated at both Judges and Sneads Caves. On this basis, 10 southeastern bats (1 male, 9 females) were collected at Judges Cave on 9 July 1983. As controls, another 10 southeastern bats (males) were collected beneath a highway bridge in Gainesville, Florida, on 27 October 1983. Bats were frozen and later shipped to Patuxent where livers and kidneys were removed for chemical analysis. Livers were analyzed for lead, chromium, zinc, and cadmium. Kidneys, because of their small size, were analyzed only for cadmium.

Judges and Geromes Caves are on the Chipola River about 11.3 and 16.1 km from the nearest contaminated part of that river (Fig. 1). Sneads Cave is on the Apalachicola River about 27.4 km from the contaminated Chipola River (Fig. 1).

Judges Cave, the most important gray bat cave in Florida, is a maternity cave in which 50,000 to 100,000 bats (10% gray, 90% southeastern) bred in 1983 when the cave was last checked. Geromes Cave is considered to be the second most important gray bat cave in Florida. In 1970 it contained 2,000 gray and 15,000 southeastern bats, but in 1982 only 200 bats (species ratio unknown) raised young there. Sneads Cave contained 100 male gray bats and 35,000 southeastern bats in 1970. In 1981, the number of bats was larger but the ratio of gray to southeastern bats was not determined. Data on the status and management of these caves and their bat populations were summarized by Wenner (1984).

Guano samples (6-12 g each) were desiccated at room temperature for 30 days with calcium sulfate. Samples for pesticide and PCB analyses were analyzed for *p,p'*-DDE, *p,p'*-DDD, *p,p'*-DDT, dieldrin, heptachlor epoxide, oxychlordane, *cis*-chlordane, *trans*-nonachlor, *cis*-nonachlor, endrin, toxaphene, and PCB's (quantified as Aroclor 1260). Samples were ground with anhydrous sodium sulfate and extracted in a Soxhlet apparatus. Pesticides and PCB's were separated by silica gel chromatography (Kaiser et al. 1980). Chemicals were quantified by electron capture gas liquid chromatography using a 1.5/1.95% SP 22-50/SP-2401 column. Average percentage recoveries from spiked Mallard (*Anas platyrhynchos*) tissue ranged from 85-103%, except *trans*-nonachlor was 75%. Residue levels were not corrected for percent recovery. The lower limits of reportable residues were 0.1 ppm (parts per million) for pesticides and 0.5 ppm for PCB's. Metal analyses of guano samples followed previously described procedures (Haseltine et al. 1981). The lower limits of reportable residues were 0.1 ppm for lead, cadmium and zinc, and 0.05 ppm for chromium.

For metal analyses of tissues, the entire organ (liver or both kidneys) was dissolved in 1 ml of concentrated nitric acid in a 15 ml polypropylene tube. Then the tube was placed in boiling water for 1 hr after which 0.5 ml of hydrogen peroxide was added and the tube was filled to 5 ml with distilled, deionized water. Zinc was determined by flame atomic absorption spectrophotometric (AAS) analysis using a Perkin-Elmer 5000 under the manufacturer's standard operating conditions. Lead, cadmium and chromium were determined by stabilized temperature Platform Furnace AAS techniques (Slavin et al. 1983). A Perkin-Elmer Zeeman 5000 equipped with a model 500 furnace controller, an AS-40 autosampler, and a Data System 10 with the HGA Graphics software were used for all determinations. Ammonium phosphate was the matrix modifier for lead and cadmium analyses; magnesium nitrate was the modifier for chromium. Standards were made in 5% nitric acid. Peak area measurements yielded characteristic masses of 11.6 pg for lead, 0.38 pg for cadmium, and 2.9 pg for chromium. Recoveries averaged 98% and residues were not corrected for percent recovery. The lower limits of reportable residues were 0.50 ppm for zinc, 0.025 ppm for lead, 0.0025 ppm for cadmium, and 0.05 ppm for chromium in livers and 0.025 ppm for cadmium in kidneys.

For comparisons with our wet weight data, we converted ppm dry weight values from two studies (Andrews et al. 1984, Hunter and Johnson 1982) to ppm wet weight by division by four on the basis of a dry/wet ratio in small rodent kidneys of about 1:4 (Linder pers. comm.). Because of positive skewness, residue data were log-transformed for statistical testing. Geometric means are given for residue data.

Results

Guano samples contained only small amounts of some organochlorines. DDE was about 0.80 ppm in all three samples. Dieldrin at 0.13 ppm was found only in guano from Judges Cave and PCB at 0.81 ppm was present only at Sneads Cave.

In contrast, comparisons with the Patuxent sample indicate that levels of chromium, zinc, and cadmium were elevated in guano from Judges and Sneads Caves, and that cadmium also was elevated at Geromes Cave (Table 1). Lead levels at Geromes Cave were similar to lead in the Patuxent colony of big brown bats, a level that other data at hand indicate is only slightly elevated.

Analyses of tissues showed zinc in livers of bats from Judges Cave to be slightly (1.1 times) but significantly (t=2.63, $0.05>p>0.01$) elevated compared to the Gainesville Colony (Table 2). Cadmium levels in livers and kidneys of bats from Judges Cave were significantly elevated by 2.4 times (t=4.51, $p<0.001$) and 3.3 times (t=3.48, $0.01>p>0.001$) (Table 2).

Levels of cadmium in liver and kidney were positively correlated in both the Gainesville bats (r=0.837, $0.001>p>0.001$) and the bats from Judges Cave (r=0.852, $0.01>p>0.001$). The amount in the liver exceeded that in the kidney in most (6 of 10) Gainesville bats, whereas the amount in the kidney exceeded that in the liver in most (8 of 10) bats from Judges Cave.

Chromium was found at low levels (0.05, 0.06 ppm) in livers of only two Gainesville bats, and it was not found in livers of any bats from Judges Cave. Lead occurred in livers of five Gainesville bats (0.05, 0.26, 0.29, 0.41, and 0.58 ppm) and four Judges Cave bats (0.15, 0.17, 0.23, and 0.23 ppm). Overall lead seems higher among the Gainesville bats, probably due to the proximity of the highway.

Table 1. Concentrations of metals (ppm dry weight) measured in samples of bat guano.

Cave or Location	Metal			
	Lead	Chromium	Zinc	Cadmium
Judges	3.4	2.7	640.	2.2
Geromes	6.1	0.83	390.	1.9
Sneads	3.9	5.0	530.	2.3
PWRC[1]	7.1	0.54	340.	0.30

[1]Patuxent Wildlife Research Center.

Table 2. Concentrations of metals[1] (ppm wet weight) in 10 southeastern bats from each of two Florida locations.

	Liver		Kidney
Sex	Zinc	Cadmium	Cadmium
	Judges Cave		
F	30.	0.85	2.9
F	27.	0.59	1.5
F	31.	0.82	1.1
F	29.	0.49	0.80
F	35.	0.36	0.22
F	29.	0.56	0.67
M	35.	0.80	1.4
F	29.	0.70	1.0
F	32.	0.66	1.4
F	34.	0.49	0.28
Geom. mean	31.0	0.612	0.889
95% conf. int.	29.1-33.0	0.503-0.745	0.508-1.56
Range	27-35	0.36-0.85	0.22-2.9
	Gainesville		
M	30.	0.35	0.24
M	29.	0.34	0.27
M	28.	0.18	0.17
M	30.	0.75	2.1
M	28.	0.19	0.19
M	30.	0.17	0.15
M	26.	0.14	0.15
M	28.	0.41	0.31
M	29.	0.29	0.24
M	27.	0.14	0.24
Geom. mean	28.5	0.256	0.266
95% conf. int.	27.5-29.4	0.173-0.378	0.154-0.460
Range	26-30	0.14-0.75	0.15-2.1

[1]Because lead and chromium were not found in most bats, these residues are not presented here but are discussed in text.

Discussion

The guano data (Table 1) suggest that bats at Sneads Cave are as contaminated as those from Judges Cave even though Sneads is 16.1 km farther from the apparent source. This may result from a high rate of interchange of bats between these caves.

Amounts of DDE, dieldrin, and PCB's measured in guano were far below levels associated with harmful effects in bats (Clark 1978, Clark et al. 1982). Similarly, the lead concentration in guano from Judges Cave was far below that in stable populations of big brown and little brown bats (*M. lucifugus*) in Maryland (Clark 1979). Chromium did not accumulate in livers, and zinc was only slightly higher than in Gainesville bats. Cadmium is the contaminant most likely to affect these bats adversely.

The average level of cadmium (arithmetic average for purposes of comparison with literature values, 1.127±0.243 ppm, range 0.22-2.9 ppm) in bat kidneys from Judges Cave was similar to values (1.30±0.22 ppm, Andrews et al. 1984) for field voles (*Microtus agrestis*) from a mine waste area in England and to values (1.8±0.2 ppm) from woodmice (*Apodemus sylvaticus*) exposed to smelter emissions in England (Hunter and Johnson 1982). However, cadmium in kidneys of field voles from the smelter site (5.8±0.9 ppm, Hunter and Johnson 1982) was higher and cadmium in common shrews (*Sorex araneus*) from both sites (39.5±3.8 ppm, Andrews et al. 1984; 48.2±7.2 ppm, Hunter and Johnson 1982) was still higher than cadmium in bat kidneys. Thus the cadmium levels found at Judges Cave are not exceptional relative to those at other contaminated sites. Because these two English studies indicated that carnivory resulted in higher cadmium accumulation than did herbivory, the bat results may be more properly compared to the shrews than to the mice.

The question of whether cadmium levels found in bats at Judges Cave were high enough to damage the population was not answered. In a comparable study with male Norway (laboratory) rats (*Rattus norvegicus*), the lowest kidney concentration of cadmium associated with renal tubular lesions was 44 ppm (Kawai et al. 1976), well above both the mean (0.889 ppm) and the maximum (2.9 ppm) found among the Judges Cave bats.

Significantly reduced survivorship in young of enclosed populations of meadow voles (*Microtus pennsylvanicus*) was associated with kidney concentrations of cadmium that averaged as low as 3.41 ppm (Maly 1984). The experimental plots had been treated with sewage sludge that contained cadmium but no cause-effect relationship was proven. Studies with laboratory rats have shown that young were more sensitive (by LD_{50} tests) to cadmium than were adults (Kostial et al. 1978).

Male laboratory rats showed focal testicular necrosis, reduced spermatogenesis, and reduced fertility associated with about 8.5 ppm cadmium in the kidneys (Kotsonis and Klaassen 1977). However, Barlow and Sullivan (1982: 141) stated that testicular damage ". . . can occur in the absence of any other signs of Cd toxicity to other organs with much higher Cd contents than the testes." This implies that testicular damage

may occur when kidney levels are less than 8.5 ppm. Nonscrotal mammalian species are generally insensitive to cadmium compounds (Barlow and Sullivan 1982: 141), however Dixit and Lohiya (1974) showed the rat-tailed bat (*Rhinopoma kinneari*) to be an exception, thus we expect that other bats may also be sensitive.

Nine of 10 bats from Judges Cave were females. Because Buhler et al. (1981) showed that female rats assimilate cadmium at a higher rate and retain more than do males, the levels of cadmium found in male bats in the contaminated colonies could be less than our data suggest. However, lead in mammals has also been found at higher levels in females than males except for the big brown bat where concentrations in males were significantly higher than females by about 1.5 times (Clark 1979). Thus our data may actually underestimate the accumulation in males. Another consideration is that testicular damage by cadmium may be prevented by simultaneous intake of zinc (Parizek 1957), and such intake of zinc obviously has occurred at Judges Cave.

The most recent population estimates (1981-83) indicated that bat numbers have remained stable or increased since 1970-71 at Judges and Sneads Caves but have decreased at Geromes Cave (Wenner 1984). Because metal levels in guano were lowest at Geromes, it seems unlikely that these contaminants have had any detrimental impact. This agrees with the overall picture gained from the literature in which the kidney concentrations of cadmium associated with harmful effects are higher than those found in these bats.

If cadmium concentrations in the contaminated colonies should increase, the first affects would probably be reduced male fertility or death of young. In a colony of tens of thousands, a contaminant that affects only 1% will effect hundreds of bats. With the basic plan for protection and management (Wenner 1984) in place, non-intrusive methods should be used to conduct regular censuses of these colonies and to look for die-offs. If numbers decline or dead are found, chemical analyses can be repeated to determine whether contaminants were involved.

Acknowledgments

We thank F. Bonaccorso, D. Franz, C. Puckett, and K. Wenner for help in collecting bats and H. Bourne for preparation of bat tissues for chemical analysis. We also thank B. Williams and K. King for critical reviews of the manuscript.

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NOTES

Repaired bill injury in the Brown Pelican.—The degree of bone injuries which birds may sustain and survive is well known for many species (Tiemeier 1941, Auk 58: 350-359), especially waterfowl (Kirby et al. 1981, Wildl. Soc. Bull. 9: 150-153; Mendall et al. 1984, Wilson Bull. 96: 305-306). The only data available for the family Pelecanidae indicate that 13.3% (N=13) of the museum specimens examined possessed repaired bone injuries, but neither the species nor the skeletal elements were identified (Tiemeier 1941). This paper reports on a repaired bill injury in the Brown Pelican (*Pelecanus occidentalis*).

On 14 November 1985, I found the partially decomposed body of an adult Brown Pelican on Pelican Island, Indian River County, Florida. The bird exhibited a healed injury to the upper mandible (Fig. 1). Close examination revealed the fractured bone elements had fused themselves such that the upper mandible was rigid and still functional. The lower mandible sustained no damage.

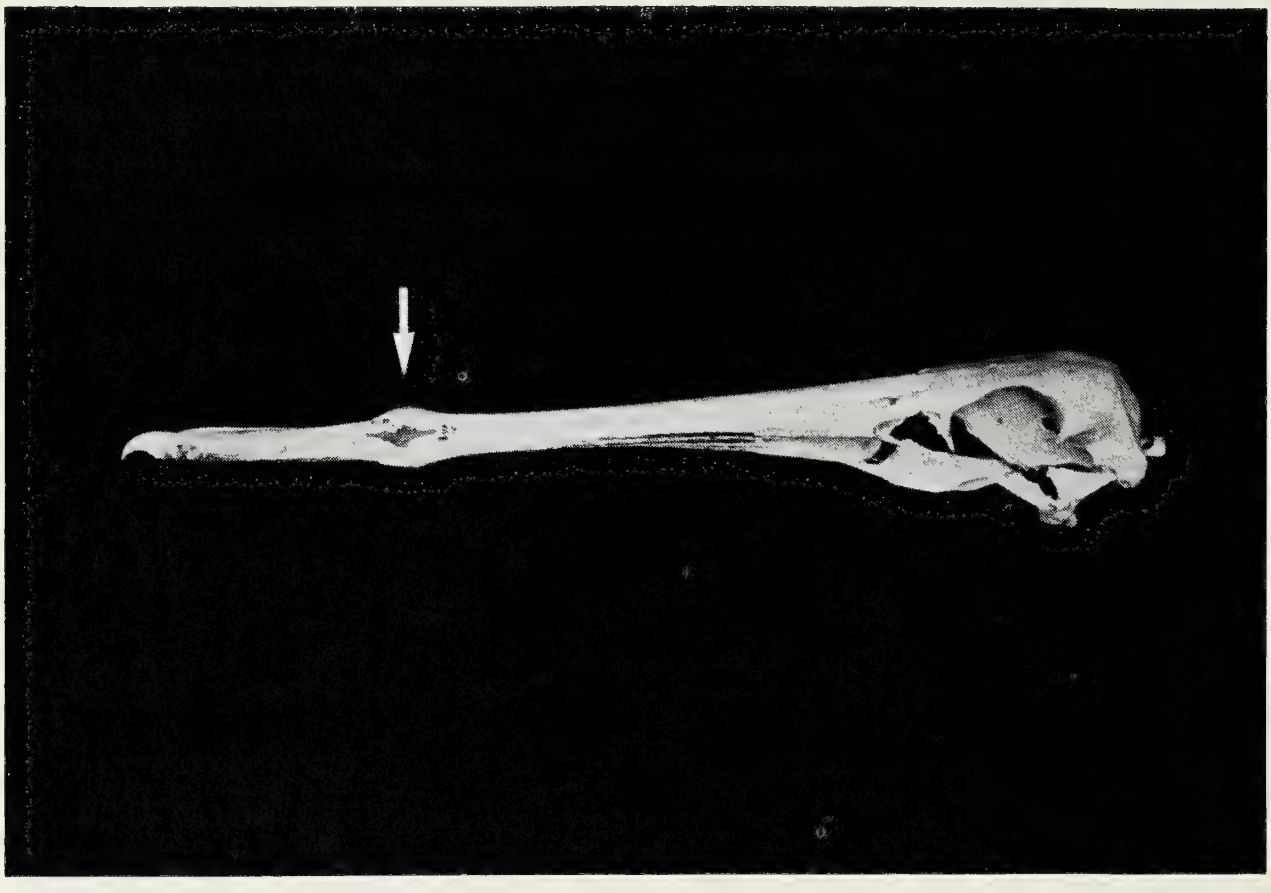

Figure 1. Right side view of Brown Pelican skull showing the location of the repaired injury to the bill.

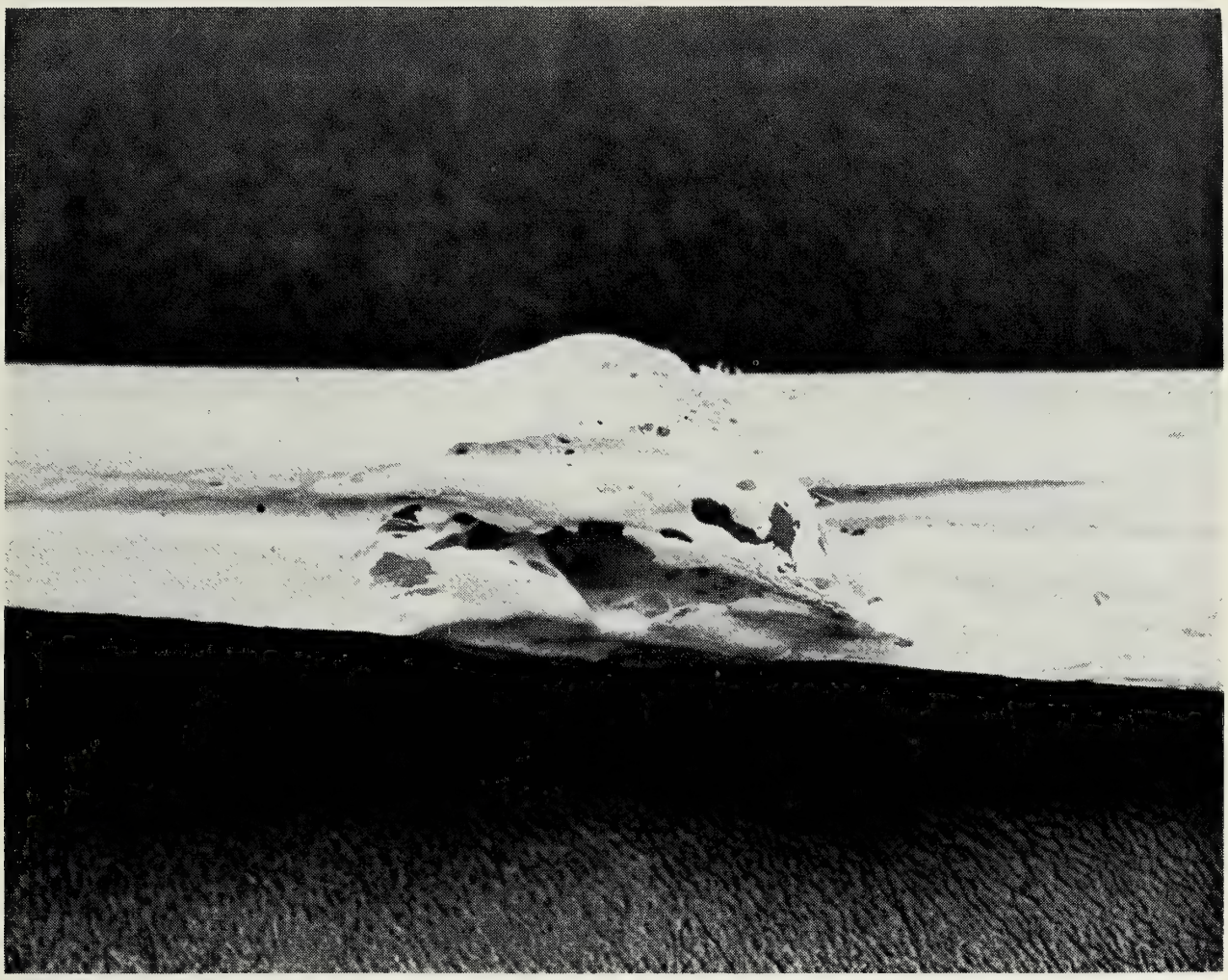

Figure 2. Close-up oblique view of the right side of Brown Pelican upper mandible indicating fusion of bone elements after injury.

While I can not be entirely certain as to the source of the injury, the size and straight path suggests a small caliber gun shot wound. The bullet apparently entered the left lateral side of the upper mandible causing minor external damage. However, there was major damage to the dorsal surface and right side due to exploding bone elements and the exiting projectile (Fig. 2). The right half of the palate also showed minor damage. It appears the distal portion of the upper mandible was maintained in place mostly by the intact left half of the bill until the damaged skeletal elements fused. Despite this rather major injury to its primary food gathering structure, the Brown Pelican lived long enough for the damage to repair itself.—**James A. Rodgers, Jr.**, Wildlife Research Laboratory, Florida Game and Fresh Water Fish Commission, 4005 S. Main St., Gainesville, Florida 32601.

Florida Field Naturalist 14: 46-47, 1986.

Clutch information for the Florida Grasshopper Sparrow from oological collections.—Egg set data on oology slips from museum collections can be used to examine temporal patterns of the reproductive biology of birds. The Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) is classified by the state of Florida as an endangered species (Kale 1978), and Delany et al. (1985) have suggested that it be classified on the Federal list as threatened or endangered. This note presents information on clutch size and date of clutch initiation of the Florida Grasshopper Sparrow obtained from oological collections and adds some historical information on its distribution and abundance omitted by Delany et al. (1985).

Methods.—I obtained information on 51 egg sets from oology slips and recorded the following data: 1) clutch size, 2) date of clutch initiation, and 3) incubation stage. I excluded data from four egg sets that were contradictory or that precluded reliable calculation of clutch size and date of clutch initiation.

I determined the date of clutch initiation from oology data following the procedure of McNair (1985). In brief, I estimated the date of clutch initiation as the date the egg set was collected minus clutch size plus one day. Additional days were subtracted from this date according to the collector's estimation of elapsed incubation time: fresh-0 day, slight-2 days, advanced-10 days, unknown-6 days (half of estimated incubation period). If the number of days of incubation was estimated and stated explicitly, I used that number.

Mean clutch size was calculated from clutches containing no fewer than three eggs. I assumed smaller clutches were incomplete (Nicholson 1938, Smith 1968). This may of course lead to an underestimate of clutch size.

Results.—Fifty-one egg sets of the Florida Grasshopper Sparrow in museum collections comprise 11.6% of Grasshopper Sparrow egg sets located in the United States and Canada (see McNair 1984, 1985 for museum collections examined). The total of 51 complete egg sets excludes numerous records of incomplete egg sets or of nests unfinished or destroyed (D. J. Nicholson and W. H. Nicholson, unpubl.). The majority (33 egg sets, 64.7%) of complete egg sets were found when fresh or slightly incubated.

I calculated mean clutch size of the Florida Grasshopper Sparrow to be 3.71 ± 0.46 SD. The mean date of clutch initiation is 9 May ± 22 days SD. The mean was 5 May and the mode was 27 April. Dates of clutch initiation ranged from 21 March to 22 June (93 days).

The great majority of records I used were collected by D. J. Nicholson and W. H. Nicholson in the Kissimmee Prairie region of south-central Florida, 8.0 to 15.5 km west and southwest of Kenansville, Osceola County. Their most intensive work occurred in 1932 and 1933, but they also collected egg sets in 1935, 1938-1939, 1945, and 1950. The only estimates of abundance they gave are of a "large colony" or "small colony" present. D. J. Nicholson and W. H. Nicholson, and J. C. Howell, Jr., collected or found a minimum of 19 nests, most of which were incomplete or unfinished, 9.8 km west of Kenansville on 23 April 1933. Assuming the Grasshopper Sparrow is primarily monogamous, the number of nests found indicate a minimum of 19 breeding pairs present. This is the largest precise count available (from oological data) for the size of any "colony". The Nicholsons found nine nests each in the Kenansville area on two other days in either 1932 or 1933.

Delany et al. (1985) do not list any records of the Florida Grasshopper Sparrow from 1945 to 1962. Hence, I summarize all available egg set data on oology slips from 1945 to 1953.

D. J. Nicholson and W. H. Nicholson collected seven egg sets, each with four eggs, from 20 April to 27 May 1945 in the Kenansville area. D. J. Nicholson and W. H. Nicholson, and C. Carter found two egg sets, of two eggs each and about five days old, on 25 June 1950 in the Kenansville area. They also found a nest with four newly hatched young.

W. H. Nicholson collected a set of three fresh eggs on 13 May 1947 near Highway 60, Osceola County. This locality is distinct from the Kenansville area.

C. Carter collected one egg set with four slightly incubated eggs on 24 May 1953 in the Kissimmee Prairie on the east-northeast side of Lake Kissimmee, Osceola County. This nest was placed under a small tuft of Pineland Threeawn (*Aristida stricta*) amid Saw Palmettos (*Serenoa repens*).

Discussion.—Information on clutch size and date of clutch initiation presented herein generally agree with the literature (Smith 1968 and others), which suggests that the Florida Grasshopper Sparrow may begin egg-laying in late March and possibly extends its breeding season into July or even afterwards. However, the lack of adequate surveys both early or late in the breeding season prevent an accurate assessment of the duration of the breeding season.

This note has also provided additional information on the distribution and abundance of the Florida Grasshopper Sparrow. To complete the information I have, in addition to C. E. Doe's breeding record near Bassinger, Okeechobee County, cited in Howell (1932), Doe also collected a set of 4 fresh eggs at the same site on 19 April 1928. Habitat information on oology slips supports the interpretation presented in Delany et al. (1985).

Acknowledgments.—I thank the American Museum of Natural History, Delaware Museum of Natural History, and Western Foundation of Vertebrate Zoology for sending me oological data without charge.

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Florida Field Naturalist 14: 48-49, 1986.

Flushing lores of a male Least Bittern.—A change and intensification of lore coloration with the onset of the breeding season is common among ardeids (Palmer 1962, Hancock and Elliot 1978, Hancock and Kushlan 1984) and is thought to emphasize certain movements of the dispaying bird (Meyerriecks 1960). Lore color of females fades as eggs are laid but color may persist in males until hatching (Meyerriecks 1960, Hancock and Kushlan 1984). Color is usually brighter in males (Meyerriecks 1960). Flushing of the lores, a rapid, short term color intensification, has been noted in some species when alarmed at the nest or

during nest relief (Cramp and Simmons 1978, Hancock and Kushlan 1984). This note describes four instances of flushing by a male Least Bittern (*Ixobrychus exilis*) during the incubation and hatching periods.

The nest was located in a 100 m X 150 m freshwater pond in Tampa, Florida. Narrow-leaved cattail (*Typha angustifolia*) was the dominat emergent and yellow pond lily (*Nuphar luteum*) covered much of the open water. The nest with three eggs was discovered on 23 May, 1982 and one egg was laid on each of the next two days. One egg disappeared on the thirteenth day of incubation and the remaining four eggs hatched after an eighteen day incubation period (calulated by the Heinroth method, see Nice 1954).

Red lores were observed on the male fourteen days and one day before the first eggs hatched, and on the two hatching days. Each instance was provoked by my approach to the nest. Fourteen days before hatching the male, upon leaving the nest, flew to a clump of cattails 4.5 m from the nest and assumed an Upright posture. His lores turned noticably red and after one minute he walked to a position 3.5 m from the nest. When I touched the nest the color of his lores intensified. The day before hatching the redness was ellicited in the same manner, but the male was only 1 m from the nest and was in a Forward display (See Hancock and Kushlan 1984). On the first hatching day the male assumed a Forward, with wings spread, 1 m from the nest when red was observed. The second hatching day the male flew to a position 2.5 m from the nest upon my approach and assumed a Forward. The female then flew 2 m from the nest and 1 m from the male. She repeatedly directed extremely vigorous Forwards, with wings spread, at the male whos lores became bright red. After several minutes the male's lores faded, he stood erect and began to preen.

The lores of Least Bitterns turn bright red during the breeding season (Weller 1961) and there is photographic evidence suggesting that flushing occurs during change-over at the nest (Hancock and Kushlan 1984). Flushing during change-over at the nest has also been observed in Little Bitterns (*I. minutus*) (Wackernagel 1950, Cramp and Simmons 1978) and Green-backed Herons (*Butorides striatus*) (Meyerriecks 1960). The lores of Snowy Egrets (*Egretta thula*) (Meyerriecks 1960) and Little Bitterns (Cramp and Simmons 1978) flush during hostile encounters during the breeding season.

My observations describe flushing by a male Least Bittern when alarmed at the nest and engaged in a hostile encounter with its mate. This is in agreement with earlier observations of flushing by ardeids. I did not see red lores on the female at any time supporting Meyerriecks (1960) contention that color is more persistent in males.

I thank W. E. Davis, A. Meyerriecks, J. Rodgers, M. Weller, and J. A. Kushlan for comments on an earlier draft of this note.

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Florida Field Naturalist 14: 49-51, 1986.

REVIEW

Wood warblers' world.—Hal H. Harrison. 1984. New York, Simon and Schuster. 24 pages of color photographs; numerous black and white photographs. $19.95.—What Florida Field Naturalist reader does not enjoy natural history vignettes of birds? This is the nature of Harrison's book. If the book had only been represented as exactly such, the reviewer's assignment would have been comfortable. Hal Harrison is to be congratulated for enjoyable readings about a fascinating taxon of birds.

Book jackets are, to be sure, advertising devices. They are designed to attract, designed to impress. This jacket beckons with comments about the book's contents. "Documented information from every source, published and unpublished." "The outstanding book on Wood Warblers." "The most comprehensive book on the subject ever published." Compelling comments, indeed! Expectations could hardly be more inflated. What reviewer isn't eager to critique the "outstanding"!

Author Harrison is a resident of south Florida (as is this reviewer). Only a very few species of warblers breed in south Florida. This situation alone suggests that more than cursory attention be accorded them. I read first the chapters devoted to "our" warblers.

In 1942 Roger T. Peterson and Earle Greene discovered Golden Warblers (now regarded a subspecies of the Yellow Warbler) breeding on the Florida Keys (see E. R. Greene, 1946, "Birds of the lower Florida Keys," Proc. Fla. Acad. Sci. 8:199-265). This was a noteworthy event! The depauperate breeding land bird avifauna of south Florida had been augmented naturally by a colonizing species from a neighboring land mass. In subsequent years the warbler spread northward along the Keys and eventually established itself on the mainland (see, e.g., O. T. Owre, 1976, "The avifauna of Biscayne Bay," Univ. Miami Sea Grant Spec. Rpt. 5:214-226). As a result of this colonization, Florida *now* has a breeding form of the Yellow Warbler. I found no mention of this in the species' account. But careful scrutiny of the breeding range map (p. 98) reveals that, although the Florida Keys are not figured (!), an area of ocean corresponding to the Keys' location is very lightly cross-hatched.

A race of the Prairie Warbler is present year-round "in the mangroves bordering coastal marshes of southern Florida" (p. 180). Prairie Warblers are very much part of the coastal mangrove avifauna. From the mainland all the way to Key West and beyond, their songs are an outstanding aural component of the landscape. The Florida Keys aren't figured on the breeding range map (p. 183) for this species either. And not even the area of the ocean where the keys should be is cross-hatched.

As for the mangroves that the Florida race inhabits, I dislike quibbling, but mangroves don't only "border coastal marshes" (p. 180). Mangroves may be the only fringing growth of the coast and they even form islets—with or without marshes. One more point. Isn't it

of more than ordinary interest that here in the mangroves we have what amounts to an "ecological race" of this warbler? And now I'll really be subjective. My goodness, Hal Harrison, I would have said less about the Prairie Warblers of the Southeast's bush-clearings and forest-edge areas. I would have written about Florida's mangroves, tree-forests *standing in salt water*, and their inhabitants, Prairie and Yellow Warblers among them. More than that, I would have described the throngs of warblers in springtime, migrants tired from their over-ocean flight, flitting about in the welcome canopy of the mangroves—landfall they had struggled for hundreds of miles to reach.

The breeding range map (p. 171) of the Pine Warbler draws my comment. Why "chop-off" the breeding range at the coastline? (You have chopped-off breeding ranges of quite a few western U.S. species at the Mexican border.) It helps one's overview of a species to know what the *entire* breeding range is. The Pine Warbler, for example, also breeds in the northern Bahama Islands and on Hispañiola. John Emlen (1978, "Density anomalies and regulatory mechanisms in land bird populations on the Florida peninsula," Amer. Nat. 112:265-286) found surprisingly denser populations of the Pine Warbler in the Bahamas than in Florida. Of more than ordinary interest, I would say, and possibly worthy of comment in the "most comprehensive" book on warblers.

Well, what else makes this book "outstanding"? The illustrations? *I'd* be pleased to have taken most of these color photographs. But can they be outstanding illustrations of these species? The singing Bachman's Warbler (plate 2) is out of focus. I can't make out much of the male MacGillivray's Warbler (plate 24). I can't discern the shapes of the bills of the male Black-throated Blue Warbler (plate 4) or of the male Townsend's Warbler (plate 8). Do male Connecticut Warblers (plate 24) and female Worm-eating Warblers (plate 18) really have blue heads and necks? Most of the photographs would be enhanced by enlargement to full page size as with the Cerulean Warbler (plate 17); as it is, most pictures are small and overcrowded on the pages. In my opinion, most of the color photographs are not outstanding. Adequate photographs of small birds, I realize, are difficult to achieve. For what I regard as some really outstanding color photographs of small birds see those by Yves-Jacques Rey-Millet in Patricia Bradley's "Birds of the Cayman Islands", 1985, Singapore, World-Wide Printing. Good paintings, reproduced as color plates, that better depict all of these species are not, however, difficult to find.

We have noted important references not in the Bibliography. Mind you, the jacket says, "documented information from every source. . . ." Robert MacArthur helped establish modern concepts of niche partitioning and other aspects of ecology. His doctoral dissertation emphasized five species of warblers. These five are sometimes spoken of as "MacArthur's warblers." Nowhere in the Bibliography do I find mention of MacArthur's "Population ecology of some warblers of northeastern coniferous forests" (1958, Ecology 39: 599-619)—or for that matter of any of MacArthur's publications in which wood warblers figured so prominently.

I enjoyed reading "Wood warblers' world." I appreciate the author's homely species' accounts. The subjective comments I have made about some of these are of the nature engendered by any review. They are not serious criticisms. My serious opinions—and I dislike being critical about such a book—result from being misled. Mr. Publisher, you beguiled me. I don't think it professional to take such a nice book and say misleading things about it. Certainly, this is the only book on North American warblers now in print. But that doesn't mean that it is, as I interpret your jacket, "outstanding." It is not the "comprehensive" work I think you have implied. And it doesn't have a "Bibliography", it has a "References Cited."

By the way, before I placed this book on my shelf, I removed the jacket.—**Oscar T. Owre,** Department of Biology, University of Miami, Coral Gables, Florida 33124.

Florida Fieldd Naturalist 14: 51-52, 1986.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 14, NO. 2 | MAY 1986 | PAGES 29-52

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PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The Florida Field Naturalist is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 14, NO. 3 AUGUST 1986 PAGES 53-84

DISTRIBUTION OF MAMMALS OF THE BAHAMAS

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Abstract.—Excluding feral populations and failed introductions, 21 species of mammals are known from the Bahamas. Four (*Procyon lotor, Rattus rattus, R. norvegicus, Mus musculus*) are regarded as introduced, three (*Lonchorhina aurita, Glossophaga soricina, Lasionycteris noctivagans*) are accidental, and two (*Pteronotus parnellii, Mormoops blainvillii*) are known in the Bahamas only as fossils. Of the 14 indigenous and presumably breeding resident (or formerly resident) species, one (*Geocapromys ingrahami*) is a rodent and the others are bats. *G. ingrahami* and three subspecies of bats (*Natalus micropus tumidifrons, Eptesicus fuscus bahamensis, Tadarida brasiliensis bahamensis*) are endemic to the Bahamas. At least 12 of the 14 resident species probably reached the Bahamas from the Greater Antilles, and the two others probably either from the Antilles or from continental North America. Cuba appears to have contributed more breeding resident species (at least six) than has any other potential source.

In the last critical review of Bahaman land mammals, Koopman et al. (1957) reported on 13 species. Since then five additional species of bats have been recorded in the archipelago, new locality records have been reported for seven others, and more information on the Bahaman hutia (*Geocapromys ingrahami*) has become available. In the present paper, I bring up to date the distribution records of all native Bahaman land mammals and some of the introduced species. Feral populations of cats, dogs, horses, donkeys, hogs, cattle, goats, and sheep are not covered (but see Campbell 1978 and Byrne 1980) nor are the apparently aborted introductions of opossums (*Diadelphis marsupialis*) to Grand Bahama in the early 1930s (Sherman 1952) and rabbits (*Sylvilagus* ?) to the Caicos Islands in the early 1970s (T. Nicholls pers. comm.).

METHODS

The nomenclature and systematic arrangement follow Hall (1981) with the following exceptions: *Mormoops blainvillii* is the name of the Antillean ghost-faced bat following Smith (1972); *Macrotus waterhousii compressus* is treated as a synonym of *M. w. minor* following Buden (1975a); *Erophylla sezekorni planifrons* and *E. s. mariguanensis* are

Florida Field Naturalist 14: 53-63, 1986.

merged with the nominate subspecies (Buden 1976); *Lasiurus borealis* is the name of the red bat (hairy-tailed bat) in the Bahamas following Honacki et al. (1982) and others. English names are from Hall (1981) and Nowak and Paradiso (1983). Notes on habits and habitat are my own unless indicated otherwise and are based on several visits to the southern Bahamas between 1972 and 1976. Museums and collections are abbreviated as follows: ANSP = Academy of Natural Sciences of Philadelphia; AS = Albert Schwartz Collection, Miami, Florida; UPS = University of Puget Sound Museum of Natural History, Tacoma, Washington.

The Islands

The Bahamas are hundreds of small to moderately large limestone islands distributed over an area about 950 km long and up to 600 km wide, from about 75 km off the southeastern coast of Florida to a little over 100 km off the northern coasts of Cuba and Hispaniola (Fig. 1). They include the politically separate but geographically contiguous Turks and Caicos Islands and several submerged banks all at the southeastern end of the chain. Andros, covering about 4200 km sq, is the largest island, but its central part is a mosaic of islets separated by narrow channels and tidal creeks. The maximum elevation in the Bahamas is 67 m on Cat Island.

The vegetation in the Bahamas is chiefly mesic broadleaf woodlands, pine forests, and scrublands in the north, and mainly scrublands and xeric woodlands in the south. The smallest islands or cays usually are sparsely vegetated with grasses, low bushes, cacti, and vines, and they resemble the rocky and sandy upper beach zones on the larger islands; some are covered mainly with mangroves. Mangrove swamps are common throughout, especially at the edges of tidal creeks and lagoons and on leeward shores generally.

Worldwide changes in sea level and climate associated with the glacial-interglacial cycles at the higher latitudes largely have shaped current biogeographic patterns in the Bahamas (see Olson 1982 and Pregill and Olson 1981). During glacial periods, when sea level was much lower than now, the Bahama banks (Fig. 1) were large "superislands," whereas during the interglacials sea level and island configurations more closely approximated those now. Although authorities disagree as to the extent of high sea level stands during the later interglacials, most agree that the last major low-stand (c. 100-130m below present sea level) was about 17,000 years ago (e.g. Masters and Flemming 1983). The kinds of fossil vertebrates found on the Great Bank indicate that the fauna was much more diverse then, that climate in the northern islands was much drier than now, and that prairie-type habitats were much more extensive (see Olson 1982). Also, the "superislands" were closer to and provided larger targets for potential colonists on the adjacent mainland and in the Greater Antilles—the close proximity of the southwestern edge of the Great Bank to Cuba is especially noteworthy.

The southern Bahamas lie on several small, precipitous banks that are separated from each other and from adjacent areas by deep water passages that apparently never were bridged by land during even the lowest sea levels of the Pleistocene. They probably were less affected physiographically by sea level fluctuations than were the northern islands, but during the low sea-level stands the presently submerged banks off the southeastern end of the chain doubtless served as stepping-stones that facilitated dispersal between the Bahamas and the Antilles.

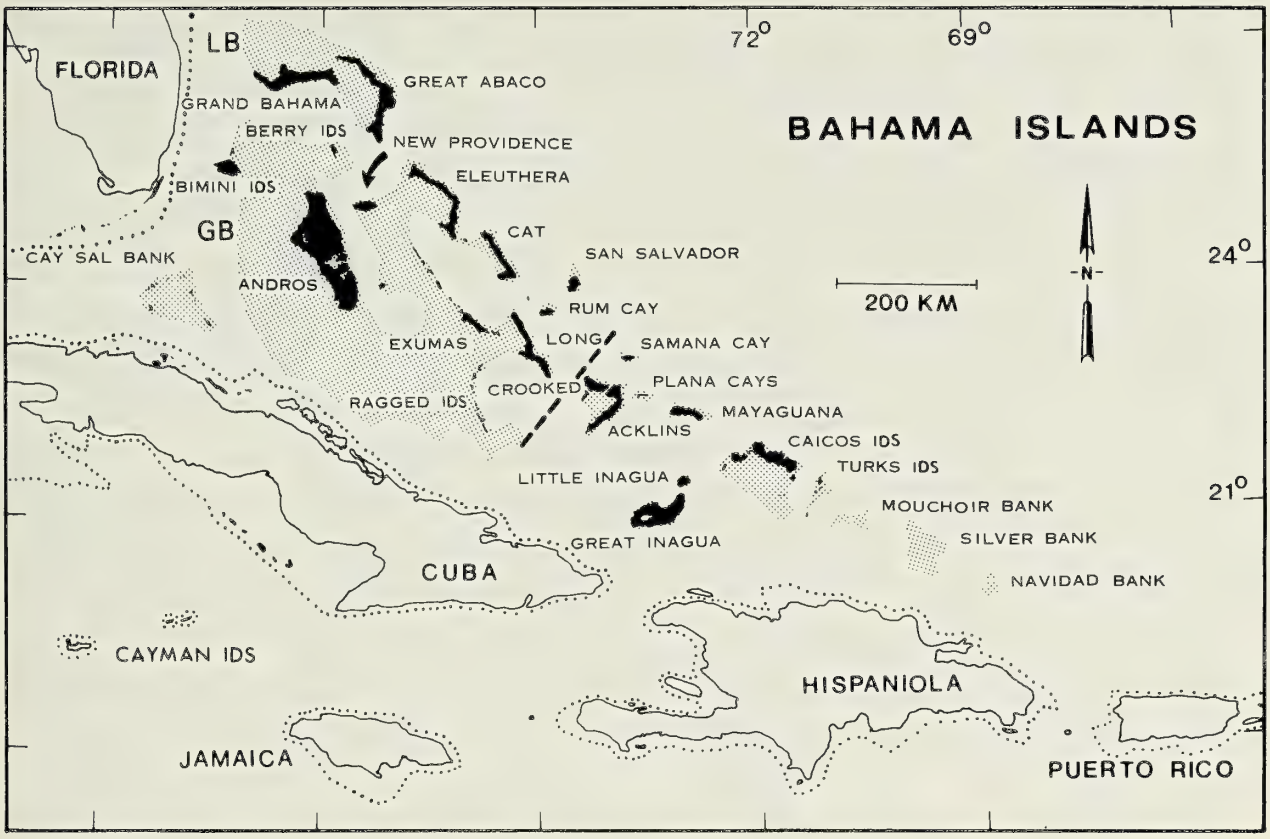

Figure 1. Map of the Bahama Islands. Stippling denotes Bahama banks and, along with dotted lines, the areas within the 100 fathom contour; LB = Little Bahama Bank, GB = Great Bahama Bank; broken line passes through the Crooked Island Passage and denotes boundary between the northern and southern Bahamas.

Species Accounts

Noctilio leporinus.—The greater bulldog bat has been recorded only one time in the Bahamas; five specimens (AS 5772-76, skins and skulls), including a gravid female, were collected on Great Inagua, by Richard Thomas, 9 and 10 February 1967. *N. leporinus* is widespread in the Greater and Lesser Antilles and in tropical America generally.

Pteronotus parnellii.—The Parnell's moustached bat is known in the Bahamas only from fossil material collected on New Providence (Olson and Pregill 1982), but it is widespread in the Greater Antilles (several different subspecies) and occurs in southern and western Mexico southward to South America.

Mormoops blainvillii.—The Antillean ghost-faced bat is known in the Bahamas only as fossils from New Providence and Little Exuma (Olson and Pregill 1982). Extant populations are confined to the Greater Antilles.

Macrotus waterhousii.—The Waterhouse's big-eared bat is widespread and common on the Great Bahama Bank and in the southern

Bahamas, but is unknown on the Little Bahama Bank. It has been recorded on Andros, New Providence, Eleuthera, Cat Island, the Exumas (Great Exuma, Darby Island), Long Island, San Salvador, Crooked Island, Acklins Island, East Plana Cay, Great Inagua, and the Caicos Islands (Providenciales, North Caicos, East Caicos). Allen (1905) reported a colony of about 75 in "one of the underground dungeons cut in the limestone rock at Ft. Charlotte," New Providence. I saw only singletons or small groups of several to approximately a dozen individuals in caves in the southern Bahamas. An abandoned house at Jacksonville, East Caicos was used as a night-time feeding roost by at least two *M. waterhousii* during 29 February-2 March 1976; the bats were observed hanging from the roof and feeding on insects (mainly large moths) several times during 1930-2100 hrs and one time each at midnight and at 0130 hrs. I consider Bahaman populations north of the Crooked Island Passage to be *M. w. minor* and those in the southern Bahamas *M. w. waterhousii* (see Buden 1975a) although some authorities (e. g. Hall 1981) treat the northern populations as an endemic Bahaman subspecies, *M. w. compressus*.

Lonchorhina aurita.—The Tomes' sword-nosed bat is known in the Bahamas only from an adult male (ANSP 1770) said to have been taken in Nassau Harbor (Miller 1905). *L. aurita* occurs elsewhere in southern Mexico southward to northern South America and Trinidad.

Glossophaga soricina.—The Pallas' long-tongued bat is known in the Bahamas only from a skull (ANSP collection) said to have been collected on an unspecified island in the archipelago (Rhen 1902). *G. soricina* occurs elsewhere in western and southern Mexico southward to South America, and in the Antilles only on Jamaica.

Monophyllus redmani.—The Leach's long-tongued bat is uncommon in the southern Bahamas, where it has been recorded from Crooked Island, Acklins Island, and the Caicos Islands (Providenciales [skull only], North Caicos, Middle Caicos), usually occurring as singletons or in small groups of 15-20 individuals. There are no records north of Crooked Island. *M. redmani* occurs elsewhere only in the Greater Antilles, where it is fairly common Bahaman populations are included under *M. r. clinedaphus*, which occurs also in Cuba and Hispaniola, but examples from the Caicos Islands have narrower skulls and differ slightly also in other measurements (Buden 1975b).

Artibeus jamaicensis.—The Jamaican fruit-eating bat is uncommon to locally common in the southern Bahamas where it has been recorded from Mayaguana, Great Inagua, Little Inagua (the only species of bat taken there) and the Caicos Islands (Providenciales), but it is unknown from the Great and Little Bahama banks. Bahaman populations are included under *A. j. parvipes*, although many specimens approach the

nominate subspecies in their larger size (Buden 1985). *A. jamaicensis* is widespread and common in the Greater Antilles (*parvipes* on Cuba and the Isle of Pines, *jamaicensis* elsewhere), and several different subspecies occur in the Lesser Antilles and in Mexico southward to South America. It has also been recorded from the Florida Keys (Lazell and Koopman 1985).

Brachyphylla cavernarum.—The Antillean fruit-eating bat has been recorded live in the Bahamas only from one cave on Middle Caicos, where no more than 30-40 individuals were seen at one time (Buden 1977), but fossil material from New Providence (see Olson and Pregill 1982) suggests it was more widespread formerly. Endemic to the West Indies, it occurs also in the Greater and Lesser Antilles, where it is common. I include the Caicos population under *B. c. pumila*, which occurs also in Hispaniola (Buden 1977), although Swanepoel and Genoways (1978, 1983) are of the opinion that Antillean populations from Cuba eastward to Hispaniola, together with the Caicos population, comprise a monotypic species, *B. nana.*

Erophylla sezekorni.—The buffy flower bat is one of the most widespread and common bats in the Bahamas, being recorded from Great Abaco, Andros, New Providence, Eleuthera, Cat Island, Great Exuma, Little Exuma, Long Island, San Salvador, Crooked Island, Acklins Island, Mayaguana, Great Inagua, and the Caicos Islands (Providenciales, North Caicos, Middle Caicos, East Caicos). Allen (1905) found "hundreds" deep in a cave at Hurricane Hole, Great Abaco—the northernmost record. Benedict (in Miller 1905) reported that the "Albatross" Expedition collected approximately 100 in a cave near Nassau during the winter of 1884/85, and that "many hundreds must have remained, as no perceptible diminution in number could be observed." Koopman et al. (1957) reported "great numbers" in caves in the Exumas. Those I saw in the southern Bahamas usually were in scattered groups of 4-50 individuals each, totalling up to several hundred in the largest caves. I include all Bahaman populations under *E. s. sezekorni* together with those from Cuba,. the Isle of Pines, Jamaica, and the Cayman Islands (Buden 1976), although several different subspecies have been recognized in this group, including *E. s. planifrons* in the northern Bahamas and *E. s. mariguanensis* in the southern Bahamas (see Hall 1981).

Natalus micropus.—The Cuban funnel-eared bat has been recorded on Great Abaco, Great Exuma (fossil only), and San Salvador. Its current status in the archipelago is uncertain and the literature on Bahaman populations is scanty. Miller (1905) reported that J. H. Riley observed approximately a dozen in a cave on San Salvador in 1903, and Allen (1905) estimated 300 in a cave at Israel's Point, Great Abaco, 7 July 1904,

although none was seen there about two weeks later. *N. micropus* occurs elsewhere on Providencia, a small island in the southwestern part of the Caribbean, and on Cuba, Jamaica, and Hispaniola. I follow Hall (1981) and others in treating Bahaman populations as an endemic subspecies, *N. m. tumidifrons*. Ottenwalder and Genoways (1982) are among those who consider them to be an endemic species.

Natalus lepidus.—The Gervais' funnel-eared bat has been recorded on Eleuthera, Cat Island, Great Exuma (fossil only), Little Exuma, and Long Island, all on the Great Bahama Bank. It probably is common locally, but its present status is unknown and the literature on Bahaman populations is scanty. It occurs elsewhere only on Cuba and the Isle of Pines. *N. lepidus* was reported in the Bahamas first by Allen and Sanborn (1937) who examined 118 specimens from Long Island and 26 from Cat Island.

Lasionycteris noctivagans.—The silver-haired bat is accidental in the Bahamas. A female (UPS 13472, skin and skull) taken on Providenciales, Caicos Islands, 15 October 1970, by Bill Biven, is the only record for the West Indies. It was found semitorpid behind a window shutter on the outside of a house. *L. noctivagans* is common throughout most of the United States and southern Canada and it usually overwinters in the southern parts of its range; the Caicos specimen is the southernmost record.

Eptesicus fuscus.—The big brown bat is uncommon to locally common in the Bahamas where it has been recorded from the Great Bahama Bank, on Andros, New Providence, Great Exuma, and Little Exuma (living and fossil), from the southern Bahamas on Crooked and Acklins Islands, and from San Salvador. Miller (1905) reported that C. J. Maynard saw several hundred "occupying a space about the size of a bushel basket" in the dungeons of old Fort Charlotte, New Providence, 22 March 1893, but other Bahaman records usually refer to much smaller groups. Populations on New Providence and San Salvador are included under *E. f. bahamensis*, and those elsewhere in the Bahamas are considered to be *E. f. dutertreus*, which occurs also in Cuba (Buden 1985).

Lasiurus borealis.—The red bat is scarce but widespread in the Bahamas, being known from Andros, New Providence, Cat Island, Long Island, Mayaguana, Great Inagua, and the Caicos Islands (Providenciales and one or more unspecified islands). I follow Honacki et al. (1982) and others in considering populations in the Bahamas, Hispaniola, and Puerto Rico as *L. b. minor*, which has been regarded as a full species (*L. minor*) by some authorities (e. g. Hall 1981, Nowak and Paradiso 1983).

Tadarida brasiliensis.—The Brazilian free-tailed bat has been recorded in the Bahamas from Great Abaco, Little Abaco, Eleuthera, Long Island, Great Exuma, Little Exuma, Crooked Island, Acklins Island, and Fortune Island. Bahaman populations are an endemic subspecies, *T. b. bahamensis*.

Rattus rattus.—The black rat is introduced, widespread, and common in the Bahamas.It is most numerous in areas of human habitation but occurs also on some remote, scrub-covered cays devoid of permanent settlements. However, little is known of the status of this and the two other introduced rodents, Norway rat (*Rattus norvegicus*) and house mouse (*Mus musculus*) on different islands in the Bahamas.

Rattus norvegicus.—The Norway rat is introduced and widespread in the Bahamas. It is less common there than is the black rat, and usually is found in urban areas or settlements.

Mus musculus.—The house mouse is introduced, widespread, and common in the Bahamas, being most numerous in or near settlements.

Geocapromys ingrahami.—The Bahaman hutia is endemic to the Bahamas. An estimated 12,000 on East Plana Cay (Clough 1972) comprise the only known natural, extant population, but five females and six males were released on a small cay in the Exumas National Sea and Land Park, 14 January 1973 (Clough 1974). Fossils or subfossils of *G. ingrahami* have been reported from Great Abaco, Eleuthera, Great Exuma, Little Exuma, Long Island, San Salvador, and Crooked Island (Olson and Pregill 1982), and fossils of *Geocapromys* unidentified as to species are known from Andros, New Providence, and Cat islands (Morgan 1977). *Geocapromys* was reported living on Samana Cay to as recently as 1931 (Barbour and Shreve 1935), and it may have been extant on New Providence during the late 1700s. Schoepf, as translated by Morrison (1911), wrote "the American marmot (*Arctomys Monax Schreb.*) has been found from the first on the larger of the Bahama islands. They call it Rabbet here, a coney, but in North America the woodjack. It lives in holes in the cliffs. and hardly grows to the size of a coney, at least those I saw on [New] Providence [during April-June 1784] were much smaller. Whoever has occasion to compare these carefully with the North American will find the two something different, in color as well as in size."

Procyon lotor.—A pair of raccoons was introduced to Grand Bahama from Florida during the early 1930s, and by the 1950s *P. lotor* had become an agricultural pest there (Sherman 1952). Raccoons are known elsewhere in the Bahamas only on New Providence where first recorded in 1784 by J. P. Schoepf who regarded them as introduced (McKinley 1959). J. H. Riley (in Miller 1905) indicated they may have been brought

to New Providence from Florida "by one of the large plantation owners many, many years ago." Bangs (1898) proposed the name *P. maynardi* for the population on New Providence, and Koopman et al. (1957) regarded raccoons as native there but treated *maynardi* as a subspecies of *P. lotor*, as have other authorities subsequently (e.g. Hall 1981). Olson and Pregill (1982) suggested that in view of the absence of *Procyon* from the rich fossil deposits on New Providence, and, as it is known on the Great Bank only on New Providence, the most populous island, it should be regarded as introduced to the Bahamas until there is evidence to the contrary.

Discussion

The Bahamas show no evidence of ever having had previous extra-archipelago land connections; presumably they were colonized over water largely, if not entirely, from the Greater Antilles and from eastern continental North America. In comparison with the Greater Antilles, the Bahamas are smaller, less diverse in habitat, and have a relatively depauperate fauna. Dispersal to the Bahamas was doubtless facilitated during glacial episodes when the sea level was much lower than now, and the islands were much larger and closer to adjacent land areas. With the exception of bats, mammals are poor at dispersal over water and generally are not well represented on islands; 16 of the 17 nonintroduced mammal species in the Bahamas are bats.

Of the 21 species of nondomesticated mammals recorded in the Bahamas, at least three (*Rattus rattus*, *R. norvegicus*, *Mus musculus*) were introduced, and *Procyon lotor* probably falls into this category. *Lonchorhina aurita*, *Glossophaga soricina*, and *Lasionycteris noctivagans* are known only as accidentals.

The 14 remaining species breed or probably breed in the archipelago, or are known there as fossils. Of these, *Geocapromys ingrahami* is the only species confined to the Bahamas and the only one that is not a bat. Its nearest living relative is *G. brownii*, endemic to Jamaica, but *G. columbianus* is known from fossils collected in Cuba. At least 11 of the 13 other species probably also reached the Bahamas from the Greater Antilles. Ten occur in the Antilles but not in adjacent continental North America. The remaining species (*Eptesicus fuscus*) occurs in North America, although Bahaman examples more closely resemble those from Cuba. *Lasiurus borealis* and *Tadarida brasiliensis* occur in continental North America as well as in the Antilles, and the direction from which they colonized the Bahamas is not clear.

On geographic grounds, Cuba and Hispaniola are the most probable Antillean sources of Bahaman mammals, and all species of bats known to breed in the Bahamas occur also on one or both of these islands. Cuba shares more taxa of mammals with the Bahamas than does any other potential source. *Natalus lepidus* is known only from Cuba (including Isle of Pines) and the Bahamas, and four subspecies of bats (*Macrotus waterhousii minor, Artibeus jamaicensis parvipes, Erophylla sezekorni sezekorni, Eptesicus fuscus dutertreus*) occur in Cuba and the Bahamas, but not in Hispaniola. *Geocapromys ingrahami* probably also is of Cuban ancestry (see above). *Noctilio leporinus* and *Monophyllus redmani* may have reached the Bahamas from Cuba, but the same subspecies occurs also in Hispaniola in the case of *M. r. clinedaphus*, and virtually throughout the Antilles in the case of *N. l. mastivus*.

No species of mammal is shared exclusively by Hispaniola and the Bahamas, but *Brachyphylla cavernarum pumila* is known only from Hispaniola and the Caicos Bank, and *Macrotus waternhousii waterhousii* occurs in the southern Bahamas and Hispaniola (also Jamaica and as fossil on Puerto Rico), but not in Cuba. Whether the fossil *Brachyphylla* on the Great Bank also are "Hispaniolan" or represent an invasion from Cuba that has since died out is unknown. That *M. waterhousii* presumably colonized the southern Bahamas from Hispaniola and the northern Bahamas from Cuba is noteworthy. In view of the close proximity of the southern islands to Hispaniola and of their isolation from the Great Bank islands, which were part of a land mass close to northern Cuba, such bipartite Cuban/Hispaniolan avenues of dispersal into the Bahamas are not surprising. However, such routes can not always be distinguished in cases of wide ranging species that show little differentiation among the islands.

Among the 12 indigenous species of mammals that probably breed in the Bahamas, one species (*Geocapromys ingrahami*) and three subspecies (*Natalus micropus tumidfrons, Eptesicus fuscus bahamensis, Tadarida brasiliensis bahamensis*) are endemic. The absence of other endemic species or of any endemic genera probably is due largely to the recent emergence of these islands from the sea (compared with the Antilles) and to the short time populations have been isolated from each other. However, *Pteronotus parnellii*, and *Mormoops blainvillii* are Antillean species known in the Bahamas only as fossils from the Great Bank, and the only evidence of *Brachyphylla cavernarum* and *Natalus micropus* on the Great Bank also is fossil, thus suggesting a more diverse bat fauna formerly, at least among the northern islands.

Acknowledgements

I thank Karl F. Koopman for reading and commenting on an earlier draft of the manuscript, Rodney Honeycutt and Maria Rutzmoser for access to mammal collections at the Museum of Comparative Zoology, Harvard University, Albert Schwartz and Murray L. Johnson for information on specimens in AS and UPS collections, respectively, and Warren L. Dimock for typing a preliminary draft.

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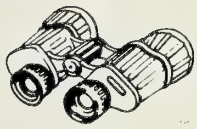

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CORRIGENDA TO "SPECIES INDEX TO FLORIDA BIRD RECORDS IN AUDUBON FIELD NOTES AND AMERICAN BIRDS"

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Abstract.—We identified 533 corrections to Special Publication #1 of the Florida Ornithological Society. These are listed by species following the original work.

In 1978, Margaret Bowman published an index to records of Florida birds published in Audubon Field Notes and American Birds. This index (Bowman, 1978, Species index to Florida bird records in Audubon Field Notes and American Birds, volumes 1-30, 1947–1976, Fla. Ornith. Soc., Spec. Publ. No. 1), was hailed as "easily the Florida Ornithological Society's most important contribution to date" (William B. Robertson, p. v *in* Bowman 1978). Despite its great value, it is inevitable that a work of this scope and complexity would contain errors.

Fred C. Lohrer (p. iv *in* Bowman 1978) appealed for information about any errors that might be found in it. Since that time, such information has accumulated, but no systematic review has been done. Therefore we undertook a systematic search for mistakes by going through the original references, comparing each entry with the citations in the index. In this paper we present the result of these joint efforts.

The common and scientific names of many species have been changed since the publication of the index. The names we used in this corrigenda are those of the 6th edition of the AOU's Check-list (American Ornithologists' Union, 1983, Check-list of North American Birds, Washington, D. C.: American Ornithologists' Union). However, we have taken the unusual and rather unorthodox step of leaving the entries in the order of the original index in order to facilitate corrections. If the scientific names have been changed, we have written the old name in parentheses immediately following the new name.

One class of corrections requires special mention. In the original articles, records from the Carribean area (Bahamas, Cuba, and the Virgin Islands) were sometimes mentioned. In her index, Bowman elected to index these as if they were Florida records. We have listed all those records for deletion, putting the location in parentheses after the citation. This permits the option of deleting them or not as one wishes.

Species List

Common Loon, *Gavia immer*, add "corrig. 14: 305" after 14: 26.
Red-throated Loon, *Gavia stellata*, add 30: 728, 829.
Horned Grebe, *Podiceps auritus*, replace 25: 569 with 25: 568.
Western Grebe, *Aechmophorus occidentalis*, replace 13: 372 with 19: 372.
Cory's Shearwater, *Calonectris diomedea* (*Puffinus diomedea*) delete 16: 469.
Greater Shearwater, *Puffinus gravis*, delete 10: 379; add 25: 67.
Sooty Shearwater, *Puffinus griseus*, replace 12: 286 with 13: 286.
Audubon's Shearwater, *Puffinus lherminieri*, add 19: 372 and 22: 26.
shearwater sp., add 10: 379, 16: 469 and 29: 44.
Wilson's Storm-Petrel, *Oceanites oceanicus*, add 29: 44, add "corrig. 31: 190" after 30: 83.
storm-petrel sp., new heading, add 29: 984.
American White Pelican *Pelecanus erythrorhynchos*, add 10: 16 (SE Coast Region report).
Brown Pelican, *Pelecanus occidentalis*, delete 10: 326; add 20: 60, 24: 673, 26: 752, and 26: 867.
Masked Booby, *Sula dactylatra*, add 18: 348 and 21: 23.
Brown Booby, *Sula leucogaster*, add 26: 849; delete 30: 945 (Bahamas).
Northern Gannet, *Sula bassanus* (*Morus bassanus*), add 10: 30 and replace 10: 340 with 11: 340.
Double-crested Cormorant, *Phalacrocorax auritus*, delete 22: 517 (Bahamas); add 26: 849.
Anhinga, *Anhinga anhinga*, add 17: 25; add 26: 849.
Magnificent Frigatebird, *Fregata magnificens*, add "corrig. 7: 236" after 5: 11, and 24: 56.
Great Blue Heron, *Ardea herodias*, replace 6: 252 with 5: 252.
Great White Heron, *Ardea herodias occidentalis*, add "corrig. 14: 305" after 14: 26.
Little Blue Heron, *Egretta caerulea* (*Florida caerulea*), add 5: 293 and 22: 446.
Cattle Egret, *Bubulcus ibis*, add "corrig. 10: 248" after 10: 20; add 24: 592; add "corrig. 26: 849" after 25: 848; replace 27: 961 with 27: 861; delete 27: 894; replace 27: 629 with 28: 629; replace 27: 892, 893 with 28: 892, 893.
Great Egret, *Casmerodius albus*, add 4: 199; replace 15: 452 with 15: 462.
Tricolored Heron, *Egretta tricolor* (*Hydranassa tricolor*), add 5: 293.
Yellow-crowned Night-Heron, *Nycticorax violaceus* (*Nyctanassa violacea*), add 10: 30; delete 23: 37 (Bahamas).
Least Bittern, *Ixobrychus exilis*, add 2: 203, 19: 46 and 26: 850.
Wood Stork, *Mycteria americana*, add 4: 199 and 30: 829.
Glossy Ibis, *Plegadis falcinellus*, delete 15: 322.
dark ibis, *Plegadis sp.*, new heading, add 12: 419, 15: 322, 17: 39, and 20: 516.
White Ibis, *Eudocimus albus*, add 11: 259.
Roseate Spoonbill, *Ajaia ajaja*, replace 16: 407 with 16: 470; add 28: 791.
Greater Flamingo, *Phoenicopterus ruber*, delete 17: 25; add 22: 600; 30: 708-9.
Brant, *Branta bernicla*, add "corrig. 14: 305" after 14: 26; add 28: 41.
Snow Goose, *Chen caerulescens*, add 18: 348.
Blue Goose, *Chen caerulescens* (*C. c. caerulescens*), add "corrig. 7: 236" after 6: 13; delete 18: 348.
Canada Goose, *Branta canadensis*, add 9: 378 (Appalachian Region report).
Mallard, *Anas platyrhynchos*, delete 23: 37 (Bahamas); add 26: 868 and 27: 762; delete 28: 42; add 30: 55.
Mottled Duck, *Anas fulvigula*, add 25: 730.

Northern Pintail, *Anas acuta*, delete 23: 37 (Bahamas).
Blue-winged Teal, *Anas discors*, add 2: 177 and 6: 193.
Eurasian Wigeon, *Anas penelope*, replace 28: 529 with 28: 629.
American Wigeon X Eurasian Wigeon hybrid, *Anas americana* X *A. penelope*, new heading, add 28: 42.
American Wigeon, *Anas americana*, delete 28: 42.
Northern Shoveler, *Anas clypeata*, replace 3: 13 with 3: 12; add 6: 193; add 13: 364; replace 27: 604 with 27: 605.
Wood Duck, *Aix sponsa*, delete 13: 364.
Ring-necked Duck, *Aythya collaris*, add 10:30; delete 22: 27 (Bahamas).
Canvasback, *Aythya valisineria*, add 27: 46.
Canvasback X American Wigeon hybrid, *Aythya valisineria* X *Anas americana*, new heading, add 28: 42.
Greater Scaup, *Aythya marila*, replace 22: 589 with 25: 589.
scaup sp., *Aythya sp.*, add 23: 469.
Common Goldeneye, *Bucephala clangula*, replace 6: 13 with 6: 21.
Bufflehead, *Bucephala albeola*, replace 5: 208 with 5: 209; replace 6: 13 with 6: 21.
Surf Scoter, *Melanitta perspicillata*, add 12: 273.
Black Scoter, *Melanitta nigra*, add 10: 31; replace 10: 244 with 10: 245; and add 21: 429.
scoter sp., *Melanitta sp.*, new heading, add 20: 32.
Ruddy Duck, *Oxyura jamaicensis*, add 6: 193; replace "20: 563 corrig. 20: 25" with "20: 563 corrig. 21: 25".
Common Merganser, *Mergus merganser*, delete 10: 258.
Red-breasted Merganser, *Mergus serrator*, add 18: 346; delete 22: 27 (Bahamas).
Turkey Vulture, *Cathartes aura*, delete 11: 258; add 19: 371.
Black Vulture, *Coragyps atratus*, add 11: 258 and 19: 371.
American Swallow-tailed Kite, *Elanoides forticatus*, replace 5: 208 with 5: 209; add 22: 615.
Mississippi Kite, *Ictinia mississippiensis*, add 10: 30.
Snail Kite, *Rostrhamus sociabilis*, add 24: 495.
Sharp-shinned Hawk, *Accipiter striatus*, replace 1: 22 with 12: 22.
Cooper's Hawk, *Accipiter cooperii*, delete 26: 75 (does not seem to refer to Florida); add 29: 70.
Red-tailed Hawk, *Buteo jamaicensis harlani*, new heading, add 30: 83, delete under main entry.
Broad-winged Hawk, *Buteo platypterus*, add 10: 30.
Swainson's Hawk, *Buteo swainsoni*, replace 25: 458 with 25: 568.
Northern Harrier, *Circus cyaneus*, add 28: 42.
Osprey, *Pandion haliaetus*, add "corrig. 5: 240" after 5: 11; add 26: 868; replace 28: 63 with 28: 64-65.
Peregrine Falcon, *Falco peregrinus*, delete 21: 428 and 29: 864.
Merlin, *Falco columbarius*, add 21: 428 and 29: 864.
Northern Bobwhite, *Colinus virginianus*, add 28: 892.
Sandhill Crane, *Grus canadensis*, delete 13: 287, 27: 46, and 28: 42.
Sandhill Crane, *G. c. tabida*, add 13: 287; add 27: 46, and 28: 42.
Limpkin, *Aramus guarauna*, delete 16: 469 (Bahamas); add 26: 868.
Sora, *Porzana carolina*, add 5: 209 (no location given, Pensacola or vicinity inferred from Weston as the reporter), add 26: 868.
Purple Gallinule, *Porphyrula martinica*, add 12: 22; add "corrig. 14: 305" after 14: 27; delete 16: 469 (Bahamas).

American Coot, *Fulica americana*, add 11: 399 ("coots").
American Oystercatcher, *Haematopus palliatus*, replace 18: 44 with 18: 444.
Semipalmated Plover, *Charadrius semipalmatus*, replace 5: 204 with 5: 294.
Snowy Plover, *Charadrius alexandrinus*, delete 23: 38 (Bahamas).
Wilson's Plover, *Charadrius wilsonia*, delete 11: 354.
Lesser Golden-Plover, *Pluvialis dominica*, replace 23: 27 with 23: 37.
Black-bellied Plover, *Pluvialis squatarola*, replace 20: 23 with 20: 32; add 21: 23; replace 20: 410 with 21: 410.
Ruddy Turnstone, *Arenaria interpres*, add 3: 234; replace 11: 248 with 11: 258.
American Woodcock, *Scolopax minor* (*Philohela minor*), add 21: 428 and 23: 38.
Common Snipe, *Gallinago gallinago* (*Capella gallinago*), add 11: 354 and 18: 350.
Whimbrel, *Numenius phaeopus* (*N. p. hudsonicus*), add "corrig. 5: 240" after 5: 11.
Upland Sandpiper, *Bartramia longicauda*, add "corrig. 5: 240" after 5: 11.
Spotted Sandpiper, *Actitis macularia*, delete 16: 471 (Bahamas).
Solitary Sandpiper, *Tringa solitaria*, delete 22: 518 (Bahamas); add 25: 590.
Greater Yellowlegs, *Tringa melanoleuca*, replace 4: 20 with 4: 206.
Lesser Yellowlegs, *Tringa flavipes*, add 11: 20, and 16: 471; replace 19: 436 with 19: 536.
Willet, *Catoptrophorus semipalmatus*, delete 16: 471; replace 26: 42 with 26: 52; replace 26: 840 with 26: 850.
Red Knot, *Calidris canutus*, delete 22: 518 (Bahamas); add 25: 569, 590-591, and 26: 868.
White-rumped Sandpiper, *Calidris fuscicollis*, delete 23: 38 (Virgin Islands); add 26: 868.
Baird's Sandpiper, *Calidris bairdii*, add 10: 30; replace 20: 247 with 20: 497; add 26: 868.
Least Sandpiper, *Calidris minutilla*, add 10: 327.
Semipalmated Sandpiper, *Calidris pusilla*, replace 9: 383 with 9: 384; add 25: 591.
Western Sandpiper, *Calidris mauri*, add 26: 848.
Sanderling, *Calidris alba*, add "corrig. 5: 240" after 5: 11; replace 28: 849 with 28: 894.
Dunlin, *Calidris alpina*, add 23: 652.
Short-billed Dowitcher, *Limnodromus griseus*, replace 3: 166 with 3: 167.
Long-billed Dowitcher, *Limnodromus scolopaceus*, add 9: 374.
dowitcher sp., *Limnodromus sp.*, add 22: 601 and 30: 709.
Stilt Sandpiper, *Calidris himantopus* (*Micropalama himantopus*), add "corrig. 5: 240" after 5: 11; replace 24: 596 with 24: 496.
Buff-breasted Sandpiper, *Tryngites subruficollis*, add 28: 42.
American Avocet, *Recurvirostra americana*, add 26: 851; replace 27: 752 with 27: 762.
Red-necked Phalarope, *Phalaropus lobatus* (*Lobipes lobatus*), add 26: 851.
Pomarine Jaeger, *Stercorarius pomarinus*, replace 13: 388 with 13: 288.
Great Black-backed Gull, *Larus marinus*, replace "corrig. 456" with "corrig. 457"; replace 19: 371 with 19: 372.
Herring Gull, *Larus argentatus*, add 26: 868.
Laughing Gull, *Larus atricilla*, add 25: 731 and 30: 57.
Franklin's Gull, *Larus pipixcan*, add 26: 595.
Bonaparte's Gull, *Larus philadelphia*, add 1: 153.
Black-legged Kittiwake, *Rissa tridactyla*, replace 12: 360 with 12: 361.
Forster's Tern, *Sterna forsteri*, add 26: 868.
Common Tern, *Sterna hirundo*, delete 20: 60.
Sooty Tern, *Sterna fuscata*, add 16: 470 and 26: 868; delete 30: 947 (Bahamas).
Least Tern, *Sterna antillarum* (*S. albifrons*), add 11: 411 and 20: 563.
Sandwich Tern, *Sterna sandvicensis*, add 10: 30; add "corrig. 14: 305" after 14: 27; add 16: 401, 25: 591, and 26: 868.

Caspian Tern, *Sterna caspia*, add 20: 517; delete 22: 518 (Bahamas).
Black Tern, *Chlidonias niger*, add 10: 389.
Brown Noddy,*Anous stolidus*, add 14: 445; delete 30: 947 (Bahamas).
Black Skimmer, *Rynchops niger*, replace 3: 169 with 3: 167.
White-crowned Pigeon, *Columba leucocephala*, delete 18: 26 (should be White-crowned Sparrow, see corrig. 18: 350); replace 21: 491 with 21: 410; delete 24: 36 (Bahamas).
Band-tailed Pigeon, *Columba fasciata*, new heading, add 22: 433 and 28: 43.
Mourning Dove, *Zenaida macroura*, add 19: 371.
Common Ground-Dove, *Columbina passerina*, add 10: 247 and 19: 371.
Inca Dove, *Columbina inca* (*Scardafella inca*), add 26: 848.
Brown-throated Parakeet, *Aratinga cf. pertinax*, new heading, add 25: 47.
Canary-winged Parakeet, *Brotogeris versicolurus*, delete 26: 595.
Canary-winged Parakeet, *B. v. versicolurus*, new heading, add 26: 595.
Red-crowned Parrot, *Amazona viridigenalis*, add 25: 47.
Yellow-billed Cuckoo, *Coccyzus americanus*, add 10: 19; delete 24: 33 (Cuba).
Black-billed Cuckoo, *Coccyzus erythropthalmus*, delete 23: 36 (Bahamas).
ani sp., *Crotophaga sp.*, new heading, add 26: 771, 868.
Burrowing Owl, *Athene cunicularia*, delete 24: 36 (Cuba).
Chuck-will's-widow, *Caprimulgus carolinensis*, delete 24: 676 (Bahamas).
Common Nighthawk, *Chordeiles minor*, delete 21: 516.
nighthawk sp., *Chordeiles sp*, add 25: 732.
Chimney Swift, *Chaetura pelagica*, replace 12: 273 with 12: 274; add 15: 28, 321, 18: 349, and 20: 576.
Ruby-throated Hummingbird, *Archilochus colubris*, replace 210 with 2: 10; add 10: 19; delete 13: 23; add 18: 349.
Rufous Hummingbird, *Selasphorus rufus*, add 6: 22, 13: 23 and 18: 349.
hummingbird sp., add 26: 52.
Northern Flicker, *Colaptes auratus*, add 29: 840.
Red-headed Woodpecker, *Melanerpes erythrocephalus*, add 10: 19.
Eastern Kingbird, *Tyrannus tyrannus*, add 10: 30, 32.
Gray Kingbird, *Tyrannus dominicensis*, add 18: 457.
Western Kingbird, *Tyrannus verticalis*, replace 4: 11 with 4: 12; add 14: 43; replace 24: 35 with 24: 36; delete 26: 72.
Scissor-tailed Flycatcher, *Tyrannus forficatus* (*Muscivora forficata*), add "corrig. 15: 325" after 14: 303; replace 26: 616 with 26: 617.
Great Crested Flycatcher *Myiarchus crinitus*, delete 24: 676 (Bahamas).
Acadian Flycatcher, *Empidonax virescens*, replace 12: 426, 427 with 13: 426, 427; re place 24: 35 with 24: 36; add 28: 66.
Least Flycatcher, *Empidonax minimus*, add 23: 38.
Empidonax sp., delete 21: 24; add 29: 682.
Eastern Wood-Pewee, *Contopus virens*, add 10: 19.
Olive-sided Flycatcher, *Contopus borealis* (*Nuttallornis borealis*), add 26: 868.
Vermilion Flycatcher, *Pyrocephalus rubinus*, add 3: 21 ("20 miles W. of Pensacola," is this in Alabama?); replace 23: 583 with 23: 582.
Horned Lark, *Eremophila alpestris*, delete 27: 47, 606.
Horned Lark, *E. a. alpestris*, new heading, add 27: 47, 606.
Tree Swallow, *Tachycineta bicolor* (*Iridoprocne bicolor*), replace 4: 11 with 4: 12; delete 16: 468 (Bahamas).
Bank Swallow, *Riparia riparia*, delete 16: 468 (Bahamas), and 471 (Bahamas).
Northern Rough-winged Swallow, *Stelgidopteryx serripennis* (*Stelgidopteryx ruficollis*), delete 21: 428-429; replace 24: 35 with 24: 36.

Barn Swallow, *Hirundo rustica*, add "corrig. 7: 236" after 6: 193; add 10: 380, 13: 23, 15: 463, 19: 30, and 23: 38; replace 26: 616 with 26: 617, 753.
Barn Swallow, *H. r. insularis*, delete 13: 23 and 23: 38.
Cliff Swallow, *Hirundo pyrrhonota* (*Petrochelidon pyrrhonota*), delete 23: 38 (Virgin Islands); add 23: 651.
Purple Martin, *Progne subis*, delete 16: 471 (Bahamas); and 23: 38 Bahamas).
Red-breasted Nuthatch, *Sitta canadensis*, add 9: 21, 18: 44, 362 ("every state"); at 20: 517 add -518 (run-on page); delete 20: 564.
Brown-headed Nuthatch, *Sitta pusilla*, add 20: 564.
Brown Creeper, *Certhia americana*, (*C. familiaris*), add 1: 7, 153, and 10: 30.
Marsh Wren, *Cistothorus palustris*, add 24: 494.
Sedge Wren, *Cistothorus platensis*, add 24: 494.
Northern Mockingbird, *Mimus polyglottos*, add 29: 841.
Gray Catbird, *Dumetella carolinensis*, add 9: 21 and 10: 30; delete 29: 841.
Brown Thrasher, *Toxostoma rufum*, delete 3: 213.
Sage Thrasher, *Oreoscoptes montanus*, add 30: 728.
American Robin, *Turdus migratorius*, add 3: 12.
Wood Thrush, *Hylocichla mustelina*, add 10: 30; delete 16: 403; add 30: 831.
Hermit Thrush, *Catharus guttatus*, add 16: 402.
Swainson's Thrush, *Catharus ustulatus*, add 8: 308, 10: 31, and 17: 27; delete 24: 33 (Cuba).
Gray-cheeked Thrush, *Catharus minimus*, add 10: 31; delete 24: 33 (Cuba).
Veery, *Catharus fuscescens*, add 14: 29.
Eastern Bluebird, *Sialia sialis*, replace 23: 669 with 23: 667.
Blue-gray Gnatcatcher, *Polioptila caerulea*, add 3: 212-213, and 10: 19.
Golden-crowned Kinglet, *Regulus satrapa*, replace 20: 425 with 20: 415.
Ruby-crowned Kinglet, *Regulus calendula*, add 17: 27.
Water Pipit, *Anthus spinoletta*, replace 29: 579 with 29: 679.
Sprague's Pipit, *Anthus spragueii*, replace 19: 372 with 19: 373; delete 24: 594 (Bahamas).
Cedar Waxwing, *Bombycilla cedrorum*, add 26: 869.
Loggerhead Shrike, *Lanius ludovicianus*, add 10: 19.
European Starling, *Sturnus vulgaris*, delete 23: 39 (Bahamas).
White-eyed Vireo, *Vireo griseus*, delete 23: 36 (Bahamas).
Bell's Vireo, *Vireo bellii*, replace 24: 35 with 24: 36.
Yellow-throated Vireo, *Vireo flavifrons*, delete 22: 30 (Bahamas) and 23: 36 (Bahamas).
Solitary Vireo, *Vireo solitarius*, add 18: 362 (inferred from Weston as one of "more than one reporter"); delete 22: 30 (Bahamas); add 22: 447.
Black-whiskered Vireo, *Vireo altiloquus*, delete 23:39 (Bahamas); replace 29: 864 with 29: 865.
Red-eyed Vireo, *Vireo olivaceus*, add 10: 19 and 16: 24.
Philadelphia Vireo, *Vireo philadelphicus*, add 10: 32 and 30: 854.
Warbling Vireo, *Vireo gilvus*, add 10: 32.
Bananaquit, *Coereba flaveola*, replace 20: 411 with 21: 411; delete 26: 596, add under new heading *Coereba flaveola bahamensis*.
Black-and-white Warbler, *Mniotilta varia*, replace 8: 13 with 8: 15; add 10: 19; replace 30: 853 with 30: 852.
Prothonotary Warbler, *Protonotaria citrea*, replace 8: 13 with 8: 15.
Swainson's Warbler, *Limnothlypis swainsonii*, add 25: 45.

Worm-eating Warbler, *Helmitheros vermivorus*, add "corrig. 7: 236" after 6: 243; add 11: 262; delete 22: 517 (Bahamas) and 519 (Bahamas), and 23: 36 (Bahamas).
Golden-winged Warbler, *Vermivora chrysoptera*, add 4: 21.
Blue-winged Warbler, *Vermivora pinus*, add 15: 404; replace 30: 731 with 30: 831.
Brewster's Warbler, *Vermivora chrysoptera* X *V. pinus*, add 30: 854.
Tennessee Warbler, *Vermivora peregrina*, add 5: 252, 10: 19, and 30:57.
Orange-crowned Warbler, *Vermivora celata*, delete 22: 30 (Bahamas) and 23: 39 (Bahamas).
Nashville Warbler, *Vermivora ruficapilla*, add 10: 32; delete 23: 36 (Bahamas).
Northern Parula, *Parula americana*, replace 4: 11 with 4: 12, and 4: 246 with 4: 247; add 10: 19.
Yellow Warbler, *Dendroica petechia*, add 9: 374, 10: 19, 326, and 12: 344; delete 16: 472 (Bahamas).
Yellow Warbler, *D. p. gundlachi*, delete 9: 374 and 12: 344; replace 20: 601 with 22: 601.
Magnolia Warbler, *Dendroica magnolia*, add 10: 19; delete 22: 517 (Bahamas); add 30: 57.
Cape May Warbler, *Dendroica tigrina*, add 9: 253; replace 16: 402 with 16: 403; add 18: 443; delete 23: 36 (Bahamas), delete 24: 33 (Cuba).
Black-throated Blue Warbler, *Dendroica caerulescens*, replace 4: 11 with 4: 12, replace 11: 336 with 11: 337; add 18: 443 and 23: 600; delete 24: 33 (Cuba); add 30: 854.
Black-throated Green Warbler, *Dendroica virens*, replace 11: 261 with 11: 262; delete 22: 517 (Bahamas).
Blackburnian Warbler, *Dendroica fusca*, replace 4: 246 with 4: 247; add 10: 32; delete 22: 30 (Bahamas); replace 30: 842 with 30: 852.
Yellow-throated Warbler, *Dendroica dominica*, replace 4: 11 with 4: 12; add 10: 19; delete 23: 36 (Bahamas).
Chestnut-sided Warbler, *Dendroica pensylvanica*, add 10: 19, 32; replace 25: 46 with 25: 45; replace 26: 40 with 26: 50.
Blackpoll Warbler, *Dendroica striata*, replace 10: 381 with 10: 380; add 18: 443; replace 19: 496, 500 with 20: 496, 500; replace 23: 653 with 23: 652.
Kirtland's Warbler, *Dendroica kirtlandii*, delete 22: 30 (Bahamas), 519 (Bahamas) and 25: 48 (Bahamas); add 27: 761.
Prairie Warbler, *Dendroica discolor*, add 8: 341, 349, 10: 18, and 26: 869.
Prairie Warble, *D. d. discolor*, delete 8: 341, 349; add 17: 456.
Palm Warbler, *Dendroica palmarum*, delete 23: 36 (Bahamas) and 24: 27.
Ovenbird, *Seiurus aurocapillus*, replace 2: 177 with 2: 176, replace 10: 256 with 10: 257; delete 24: 33 (Cuba).
Northern Waterthrush, *Seiurus noveboracensis*, add 10: 19; delete 16: 472 (Bahamas).
Louisiana Waterthrush, *Seiurus motacilla*, add 10: 247; replace 13: 364 with 13: 365; delete 22: 519 (Bahamas).
Kentucky Warbler, *Oporornis formosus*, add 20: 564.
Mourning Warbler, *Oporornis philadelphia*, delete 21: 412; add 27: 48.
MacGillivray's Warbler, *Oporornis tolmiei*, delete 21: 412.
Oporornis sp., new heading, add 21: 412.
Common Yellowthroat, *Geothlypis trichas*, add 10: 19; replace 11: 248 with 11: 258; delete 24: 33 (Cuba).
Yellow-breasted Chat, *Icteria virens*, delete 6: 251 (error in original text, Ft. Morgan is not in Florida); delete 23: 36 (Bahamas); add 24: 618-619.
Hooded Warbler, *Wilsonia citrina*, replace 1: 163 with 1: 153; delete 23: 39 (Bahamas).

Wilson's Warbler, *Wilsonia pusilla pileolata* or *chryseola*, new heading, "sub-species of the far West" 26: 53.
Canada Warbler, *Wilsonia canadensis*, add 27: 48.
American Redstart, *Setophaga ruticilla*, add 3: 13; add "corrig. 12: 26" after 11: 401; delete 23: 36 (Bahamas); add 26: 869.
House Sparrow, *Passer domesticus*, add 15: 50.
Bobolink, *Dolichonyx oryzivorus*, add 21: 498.
Western Meadowlark, *Sturnella neglecta*, replace 11: 252 with 11: 262.
Montezuma Oropendola, *Psarocolius montezuma*, new heading, add 14: 305 and 15: 34.
Red-winged Blackbird, *Agelaius phoeniceus*, delete 24: 595 (Bahamas).
Orchard Oriole, *Icterus spurius*, add 7: 268 and 13: 38 (no location given, but Pensacola vicinity inferred from Weston as an observer).
Northern Oriole, *Icterus galbula*, add 3: 212; add 11: 262; after 17: 320, replace "corrig. 456" with "corrig. 457".
Rusty Blackbird, *Euphagus carolinus*, delete 24: 595 (Bahamas).
Brewer's Blackbird, *Euphagus cyanocephalus*, replace 23: 583 with 23: 582.
Common Grackle, *Quiscalus quiscula*, replace 17: 371 with 19: 371.
Brown-headed Cowbird, *Molothrus ater*, add "corrig. 4: 292" after 4: 12; replace 9: 252 with 9: 251; and add 11: 412-413.
Bronzed Cowbird, *Molothrus aeneus*, add 16: 403.
Western Tanager, *Piranga ludoviciana*, add 11: 338-339.
Scarlet Tanager, *Piranga olivacea*, add 2: 177 and 10: 31.
Summer Tanager, *Piranga rubra*, add 2: 177, and 10: 19.
Stripe-headed Tanager, *Spindalis zena*, replace "corrig. 322" with "corrig. 399."
Rose-breasted Grosbeak, *Pheucticus ludovicianus*, replace 2: 177 with 2: 176; add 7: 268 and 10: 32; delete 23: 36 (Bahamas).
Blue Grosbeak, *Guiraca caerulea*, add 10: 31; replace 20: 400 with 20: 500, replace 29: 853 with 29: 843.
Indigo Bunting, *Passerina cyanea*, add 2: 177; at 11: 337 delete one of two; delete 23: 36 (Bahamas); replace 26: 761 with 26: 751; add 29: 843.
Painted Bunting, *Passerina ciris*, add 12: 344.
Possible Lazuli X Indigo Bunting hybrid, *Passerina amoena X P. cyanea*, new heading, add 21: 412.
Cuban Grassquit, *Tiaris canora*, add "corrig. 7: 13" after 6: 244.
Dickcissel, *Spiza americana*, add 10: 31 and 27: 48.
Purple Finch, *Carpodacus purpureus*, add 10: 31; replace 18: 360 with 18: 350.
Pine Siskin, *Carduelis pinus*, add 20: 415.
Rufous-sided Towhee, *Pipilo erythrophthalmus*, add 3: 12 and 12: 272.
Rufous-sided Towhee, *P. e. erythrophthalmus*, delete 12: 272.
Savannah Sparrow, *Passerculus sandwichensis*, add 5: 24.
Grasshopper Sparrow, *Ammodramus savannarum*, add 7: 270; delete 27: 862.
Grasshopper Sparrow, *A. s. floridanus*, add 27: 862.
Le Conte's Sparrow, *Ammodramus leconteii* (*Ammospiza caudactus*), add 10: 32.
Sharp-tailed Sparrow, *Ammodramus caudacutus* (*Ammospiza caudacuta*), replace 9: 261 with 9: 251.
Vesper Sparrow, *Pooecetes gramineus*, add 1: 7.
Lark Sparrow, *Chondestes grammacus*, add 10: 32; delete 20: 34; add 24: 38.
Lark Sparrow, *C. g. grammacus*, new heading, add 20: 34.
Chipping Sparrow, *Spizella passerina*, replace 12: 429 with 13: 429; delete 22: 31 (Bahamas).

Clay-colored Sparrow, *Spizella pallida*, replace 19: 372 with 19: 374.
White-crowned Sparrow, *Zonotrichia leucophrys*, add "corrig. 7: 236" after 6: 193, add 12: 22, 26; add 18: 26 (mistakenly listed as White-crowned Pigeon, see corrig. 18: 350); delete 21: 408.
White-throated Sparrow, *Zonotrichia albicollis*, add 21: 408.
Fox Sparrow, *Passerella iliaca*, add 15: 325; replace 19: 373 with 19: 374.
Lincoln's Sparrow, *Melospiza lincolnii*, add 10: 32, 247; delete 25: 850 (Cuba).

Acknowledgments

We wish to thank all those who called errors to our attention, James A. Kushlan for helpful comments on the manuscript, and Terry West for help with proofreading.

REPORTS

Summary of the 1986 spring meeting.—The spring meeting of the Florida Ornithological society was held at the Plantation Yacht Harbor on Plantation Key, Florida. Dr. Tom Bancroft and the National Audubon Society office in Tavernier were our hosts from 2-4 May. President Bob Brown thanked the local committee for their efforts and announced that the fall meeting would be in Winter Haven.

During the board meeting, James Kushlan gave his final report as Editor of the Florida Field Naturalist. Herb Kale reported that Jim Cox's work on the distribution of the Florida Scrub Jay is being readied as Special Publication no. 3. Bancroft announced that this year's Helen G. and Allan D. Cruickshank Research Award is being given to P. William Smith for work on "the Origin and Affinities of *Streptopelia* Doves in Florida."

Members of the National Audubon Society's research program in Florida presented the Saturday paper session, which was moderated by John Ogden. The papers presented were: "Florida Bay Wading Bird Studies," by George Powell; "Recent Trends in Colonial Wading Bird Populations in Tampa Bay," by Richard Paul; "Ecology of Florida Bay Mud Banks," by George Powell and Jeff Holmquist; and "Recent Status of the Wood Stork in the Southeastern United States," by John Ogden. In addition, Ted Below spoke on his work with sandpipers at Rookery Bay. A Breeding Bird Atlas workshop was held after the paper session.

A very successful pre-convention trip to the Dry Tortugas was held 30 April-1 May. Field trips were held on Saturday morning to Long Key State Park and to Lignumvitae Key. A pelagic trip was available on Sunday morning. Others participated in Breeding Bird Atlas "Blockbusting" parties Sunday morning.

The song quiz, prepared by Dave Goodwin, was won by Bill Pranty. The skin quiz, prepared by Oscar Owre, was won by Kevin McGowan. Both winners received carvings of Flamingoes.—**Bruce Neville,** 8221 SW 72 Ave., #273, Miami, Florida 33143.

NOTES

Inland nesting of Black Skimmers.—At an inland site 73 km west of the Atlantic coast of Florida, we found a Black Skimmer (*Rynchops niger*) incubating two eggs. This nest, found on 9 June 1985, was on a marl road beside a flooded field in an extensive agriculture area (Fig. 1) at Duda Farms near Belle Glade, Palm Beach County, Florida. The only known inland nesting of Black Skimmers in the USA was reported at Salton Sea, California (McCaskie 1972, Am. Birds 26:906).

From 9 June through 8 September the number of birds observed at the nesting location fluctuated from 58 to 270. The accuracy of the chronology and results of nesting observed in June through 3 October 1985 as shown in Table 1 was somewhat limited as observers tried to keep their visits brief so as to limit disturbing the skimmers as much as possible.

The use of flat gravel covered roofs near the coast by nesting skimmers in recent years appears to be a direct result of the loss of coastal beach habitat through increased encroachment on coastal areas by man-made structures and people (Fisk 1978, Fla. Field Nat. 6:1-8; Greene and Kale 1972, Fla. Nat. 4:15-17). The presence of this breeding colony at Duda Farms is another indication of the loss of natural nesting grounds in coastal areas. The ability of Black Skimmers to change colony sites readily (Clapp et al. 1983, Marine birds of the southeastern U. S. and Gulf of Mexico, Washington, DC: U. S. Fish and Wildlife Service) apparently provides skimmers the flexibility to experiment with different types of nesting habitat.

Figure 1. Inland nesting habitat of Black Skimmers.

Table 1. Nesting Chronology of the Duda Farms Black Skimmer Colony.

Date	Fresh scrapes	Nests	1e[1]	2e	3e	4e	Broken eggs	Young
9 Jun	9	1	0	1	0	0	0	0
29 Jun	10	6	1	3	0	0	2	0
6 Jun	10	7	1	2	3	1	0	0
13 Jul	0	8	2	0	5	1	0	0
27 Jul	16	15	4	6	5	0	0	0
3 Aug	1	6	0	5	0	1	0	0
17 Aug	1	2	1	0	1	0	0	0
31 Aug	0	3	1	1	0	0	0	3 small, 2 dead
8 Sep	0	2	1	1	0	0	0	1 1/3 grown
3 Oct	0	0	0	0	0	0	0	2 flying

[1]1e = one egg, 2e = two eggs, 3e = three eggs.

The unexplained loss of many nests, observations of broken eggs and flattened young, and our observing only two fledged young show the hazards faced by skimmers attempting to nest inland. Disturbance by field observers and others may have been a factor (Safina and Burger 1983, Condor 85:164-171) despite our efforts to discourage observers from using the nesting road by placing a large barrel in the middle of the road. However, the skimmers started using the parallel road across the canal as well, so our efforts to control access were fruitless. Two large dogs near the nesting colony on 29 June also could have presented problems for the skimmers.

We want to thank Marge Eaton, Robert Flores, Brian Hope, Tom McElroy, and Paul W. Sykes for their field observations and Herbert W. Kale II and James A. Kushlan for their help with the manuscript.—**H. P. Langridge,** 1421 W. Ocean Ave., Lantana, Florida 33462 and **Gloria S. Hunter,** 1716 13th Ave. N., Lake Worth, Florida 33460.

Florida Field Naturalist 14: 73-74, 1986.

Prey handling by Anhingas.—The Anhinga (*Anhinga anhinga*) usually feeds underwater by impaling a fish with its mandibles. After surfacing, the Anhinga tosses its head backward, freeing the fish which it catches in mid-air and mouths to position for headfirst swallowing (Owre 1967, Ornithol. Monogr. 6: 1-38). We observed two Anhingas using trees to ready fish for swallowing. Each Anhinga used the tree differently, and we believe for a different purpose.

The first observation was made on 23 March 1984 at 1520 h EST at 'Ding' Darling National Wildlife Refuge, Florida. We saw a male Anhinga swimming with a laterally flattened fish, about 15 cm in length, held between its mandibles. The Anhinga swam about 30 m to a mangrove thicket, frequently tossing its head back. After submerging approximately 1 m from the thicket, the bird climbed onto a mangrove root about 0.5 m above the water and proceeded to strike the fish against a neighboring root 30 times in about 2 min. The Anhinga then tossed its head backward, releasing the fish from its bill. The fish was caught and swallowed headfirst. The bird proceeded to wingspread facing northwest. A. Margaret Elowson (pers. comm.) also saw this Anhinga and corroborates our observation.

The second observation took place on 26 March 1984 at 1151 h EST on Anhinga Trail, Everglades National Park, Florida. The Anhinga (its sex was not recorded) was perched about 0.3 m above the water surface on a branch of a fallen tree. A centrarchid-like fish, about 15 cm long, was impaled by the bird's upper and lower mandibles. The Anhinga

brushed the impaled fish against the branch of the tree. Each bout of brushing began with the lowering of the bird's head and placement of its bill against the branch. The Anhinga forced the fish toward the tips of its mandibles by drawing its bill across the branch from base to tip while rotating its head and bill from side to side. Each bout was interrupted by tossing. The fish was removed from the lower mandible after four bouts of brushing and tossing, and was thrown from the upper mandible, caught, and swallowed headfirst, after two more bouts of brushing.

In the first observation, the mangrove root was used as a substrate on which to strike the fish. The fish was not impaled and possibly too active for swallowing, or to be thrown from the mandibles and successfully caught. It is likely that the injury caused by impalement is important in subdueing prey. Consequently, when a fish has not been impaled battering may follow.

The second observation is similar to those described by Owre (1967, pp. 129-130). In each instance, a large catfish was brought to the surface and dragged to shore without once lifting it from the water. The fish were freed by vigorously wiping the mandibles against branches. Owre hypothesized that the impaled fish were too heavy and thick-bodied to be thrown from the mandibles. In our observation, the fish was thin-bodied and not so heavy as to prevent the Anhinga from lifting its head, but the mandibles may have been driven so deeply into the fish that removing it was difficult. The branch was used to manipulate the fish to a position where it could be successfully thrown from the mandibles.

We would like to thank Jeffrey R. Baylis, Jeanne Beattie, A. Margaret Elowson, and Charles Treyball for their help and especially Oscar T. Owre for his comments on a previous draft of this manuscript and Jack P. Hailman for his quidance on the Field Ethology field trip of the Department of Zoology, University of Wisconsin, during which these observations were made.—**Charlie Wellenstein,** 11030 Maple Lane, Wauwatosa, Wisconsin 53225 and **Danile D. Wiegmann,** 5816 Evarit Drive, Racine, Wisconsin 53406.

Florida Field Naturalist 14: 74-75, 1986.

Bahama Mockingbird in West Palm Beach.—On 14 April 1985, I found a singing Bahama Mockingbird (*Mimus qundlachii*) in my yard in southeastern West Palm Beach, Palm Beach County, Florida (Fig. 1). This bird had been singing for three previous days before I identified the singer, and it stayed for five more days before disappearing.

The brownish gray color, streaking on the breast and flanks, white tipped tail, no white wing patches, and faint buffy wingbars were noted by 158 observers from eight different states. As I have seen this species many times in the Bahamas, especially on Eleuthera, I was interested in the behavior patterns. It sang frequently from thick cover as well from wires. The melodic song was short and repetitive with four or five phrases. It did not imitate other birds. A Northern Mockingbird (*Mimus polyglottos*) harrassed the Bahama Mockingbird frequently but did not succeed in driving it away or changing its behavior patterns.

This bird seemed oblivious of the presence of many photographers, recording persons, observers, and the media and was even found running about the street in early morning and late afternoon. While in the street, the bird's wings drooped slightly, and the tail was fanned frequently. The bird ate insects and the berries of the Brazilian pepper (*Schinus terebinthifolius*), gumbo limbo (*Bursera simaruba*), and native red mulberry (*Morus rubra*). Out yard has been planted to resemble coastal hammock, and this may have been an attractant.

Since Russell (Russell et al. 1980, Fla. Field Nat. 8: 31-32) reviewed the records to that date for North America, Sandy Sprunt and Karen Sunderland found a Bahama Mockingbird on Long Key on 10 June 1982 (Paul 1982, Amer. Birds 36:970). This sighting in West Palm Beach is the fifth for the United States, the only record for mainland North America, and the earliest spring date for this species.

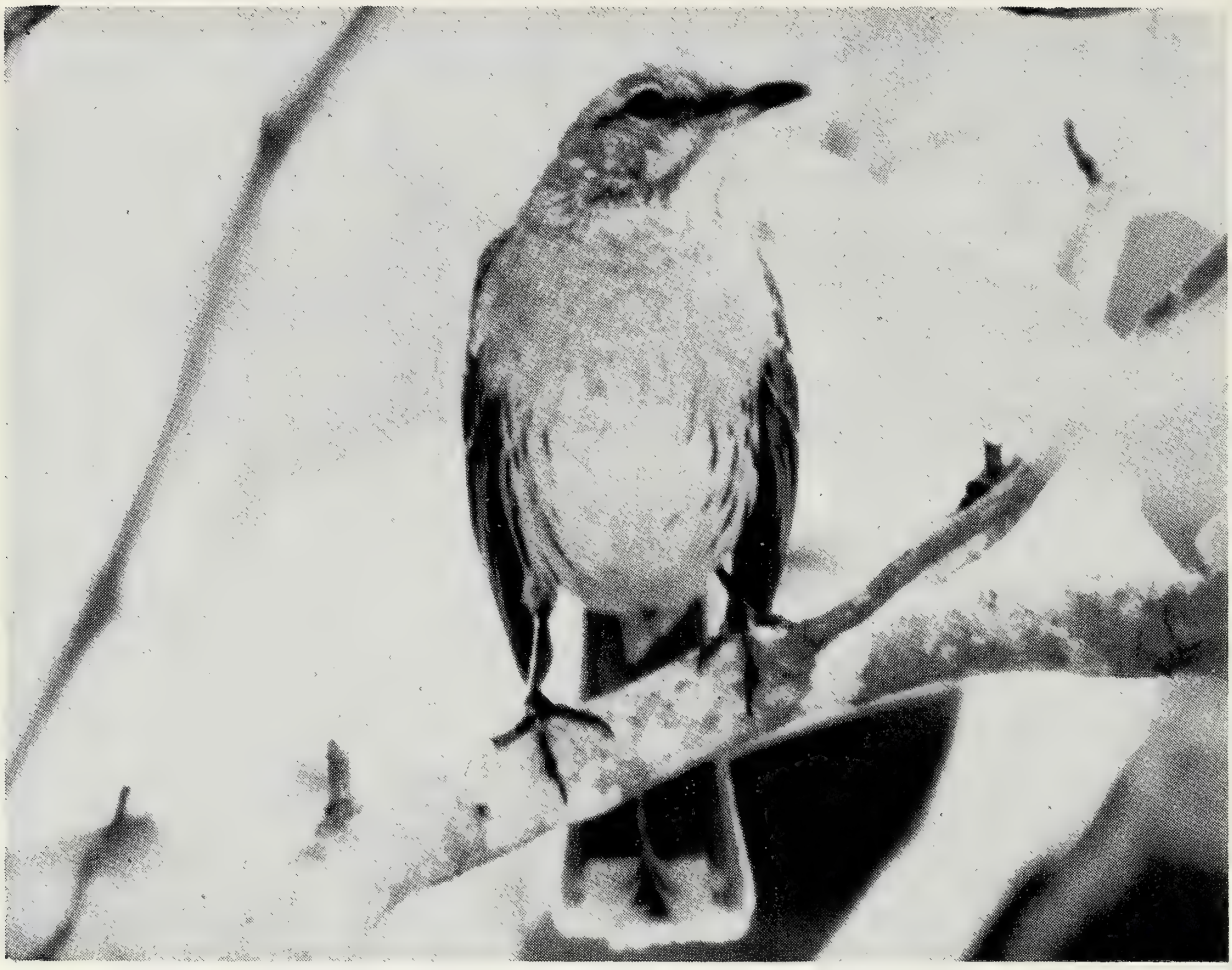

Figure 1. Bahama Mockingbird in Palm Beach County, Florida, by Ray Plockleman.

A tape of the song, made by Al Liberman, has been deposited with the Florida State Museum, Bioacoustics Archive, as Cut no. 5 of Master Tape 781. A color slide, by Ray Plockelman, has been submitted to Florida state Museum.

I wish to thank Howard Langridge for his help and Wesley Biggs for providing records and additional information.—**Cynthia Plockelman,** 311 Franklin Rd., West Palm Beach, Florida 33405.

Florida Field Naturalist 14: 75-76, 1986.

Recolonization of Pelican Island by Reddish Egrets.—Although Bryant (1859, Proc. Bost Soc. Nat. Hist. 7: 5-21) observed Reddish Egrets (*Egretta rufescens*) nesting on Pelican Island, Brevard County, Florida, no records are known to us from the Twentieth century. Here we report on the recolonization of Pelican Island by Reddish Egrets.

During the course of monitoring the reproductive success of Wood Storks (*Mycteria americana*), we located a single Reddish Egret nest in prickly pear cactus (*Opuntia* sp.) on 2 May 1985. The nest contained three dark-phase nestlings about two weeks old with an attending dark-phase adult. On 29 May, the three fledglings were observed foraging along the shoreline.

We suspect that dark-phase Reddish Egrets nested at Pelican Island prior to 1985. Two recent fledglings were seen along the shoreline on June 9 and 23, 1982 (Paul 1982, Amer. Birds 36: 968). Adults frequently were present during the spring and summer of 1984, and we often saw them flying into the mangroves on the island. Paul et al. (1979, Fla. Field Nat. 7: 24-25) reported single Reddish Egret nests on Riomar Island, Indian River County and on Haulover Island, Brevard County in 1978. Bill Leenhouts of the Merritt Island National Wildlife Refuge (pers. comm.) indicated Reddish Egrets are still observed in low numbers at the Haulover Island colony, and Paul (1982) reported Reddish Egrets nested on Riomar Island as late as 1982. Although Reddish Egrets have successfully reestablished a breeding population along the west coast of Florida in Tampa Bay (Paul et al. 1975, Fla. Field Nat. 3: 9-10; pers. comm.), they have been slow to recolonize and increase their numbers along the Atlantic coast.

We thank J. A. Kushlan and R. T. Paul for providing helpful comments on this note.—
James A. Rodgers, Jr.. and **Stephen T. Schwikert**, Wildlife Research Laboratory, Florida Game and Fresh Water Fish Commission, 4005 S. Main St., Gainesville, Florida 32601.
Florida Field Naturalist 14: 76-77, 1986.

Additional observations on the reproductive success of herons on the west coast of Florida.—In an earlier paper, I reported on the breeding success of three species of herons in Tampa Bay (Rodgers 1980a). In this note I present further observations on the reproductive success of the Little Blue Heron (*Egretta caerulea*), Tricolored Heron (*E. tricolor*), Snowy Egret (*E. thula*), Black-crowned Night-Heron (*Nycticorax nycticorax*) and Yellow-crowned Night-Heron (*N. violaceus*) in the Tampa Bay region of Florida.

Data were collected at weekly intervals during 1979 and 1980 on Sunken Island (colony no. 615007), Hillsborough Bay, Hillsborough County and Bird Key (colony no. 615027), Terra Ceia Bay, Manatee County. The dominant nesting vegetation on the dredged material Sunken Island is Brazilian pepper (*Schinus terebinthefolius*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and cabbage palm (*Sabal palmetto*). Bird Key is a natural island dominated by black and red (*Rhizophora mangle*) mangroves. Full descriptions of their location, other wading birds present, and vegetation are in Lewis and Lewis (1978), Rodgers (1980b) and Nesbitt et al. (1982). Because of the small sample size, data for both years were combined.

Clutch size, percent of eggs hatching and nestling survivorship to two weeks of age are in Table 1. For all species, egg survivorship to one week of age was high, but exhibited a large decrease between one and two weeks of age. No obvious sources for nest, egg, or nestling loss were identified. Usually, the nest and/or its contents disappeared between my visits. Similar reproductive rates were reported by Rodgers (1980a) for Tricolored Herons and Snowy Egrets; however, the breeding success of Yellow-crowned Night-Herons in this study tended to be greater, especially clutch size. Overall, the reproductive rates of ardeids on Sunken Island and Bird Key are intermediate to those reported elsewhere (see reviews in Palmer 1962, Wiese 1978, Rodgers 1980a, 1980b, Black et al. 1984).

I thank the National Audubon Society for major funding, use of equipment and permission to work on the Tampa Bay Sanctuaries. B. B. Black and M. F. Delany commented on drafts of this manuscript.

Table 1. Reproductive success parameters for five heron species on Sunken Island and Bird Key, Florida, during 1979-1980.

	Little Blue Heron[1,4]	Tricolored Heron[2,5]	Snowy Egret[2,6]	Black-crowned Night-Heron[3,7]	Yellow-crowned Night-Heron[3,8]
Clutch size					
$\bar{x} \pm$ S.E.	3.40 ± 0.24	2.79 ± 0.07	3.12 ± 0.11	3.09 ± 0.16	3.79 ± 0.19
mode	3	3	3	3	3
range	3-4	2-4	2-4	2-4	2-6
No. eggs hatched/nest					
$\bar{x} \pm$ S.E.	2.75 ± 0.25	2.54 ± 0.09	2.91 ± 0.15	2.89 ± 0.20	3.50 ± 0.21
mode	3	3	3	3	3
range	2-3	1-4	1-4	2-4	2-5
percent	91.67	94.71	96.26	96.30	95.45
No. 1-week young/nest[9]					
$\bar{x} \pm$ S.E.	2.60 ± 0.24	2.29 ± 0.09	2.52 ± 0.15	2.55 ± 0.21	3.29 ± 0.20
mode	3	2	2	3	3
range	2-3	0-4	0-4	1-3	1-5
No. 2-week young/nest[9]					
$\bar{x} \pm$ S.E.	1.00 ± 0.45	1.78 ± 0.10	1.76 ± 0.16	2.30 ± 0.26	2.67 ± 0.23
mode	2	1	2	3	3
range	0-2	0-3	0-3	1-3	0-5
Survival rates					
egg—1 week	85.42%	94.13%	94.44%	96.30%	94.10%
egg—2 weeks	30.00%	63.68%	56.76	75.83%	69.51

[1]Data from Bird Key.
[2]Data combined from Sunken Island and Bird Key.
[3]Data from Sunken Island.
[4]N=5 nests.
[5]N=72 nests.
[6]N=42 nests.
[7]N=11 nests.
[8]N=28 nests.
[9]Nestling age based on hatching date of first egg.

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James A. Rodgers, Jr., Wildlife Research Laboratory, Florida Game and Fresh Water Fish Commission, 4005 S. Main Street, Gainesville, Florida 32601.

Florida Field Naturalist 14: 77-79, 1986.

FLORIDA BIRDS IN THE PERIODICAL LITERATURE

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This list contains 48 citations to recent (1983-1985) articles about Florida birds excluding those published in the Florida Field Naturalist. Authors are encouraged to send reprints of their articles to the compiler for inclusion in this annual feature.

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Florida Field Naturalist 14: 79-82, 1986.

REVIEWS

The peacocks of Baboquivari.—Erma J. Fisk. 1983. New York, New York: W. W. Norton and Company, 284 pp, $14.95 hardcover.—From mid-December 1978 through early May 1979 "Jonnie" Fisk lived on a Nature Conservancy ranch in Thomas Canyon, Pima County, Arizona. Living alone in this isolated locale she did extensive mist netting of birds, thrived under somewhat primitive living conditions, communed with nature, kept notes, wrote letters, and put up with the cats and local peacocks (and thus the title). This is a thoroughly enjoyable "autobiography," written by a lady who many of us have enjoyed and benefitted in many ways over the years from knowing. You may learn more about Jonnie from reading this book than about Arizona and its wildlife. If you have not been priviledged to receive a Jonnie Fisk letter in person, read this book and learn that she is: breathless, inquisitive, warm, contrite, helter-skelterish, caring, full of vigor and excitement. You will also learn about having a positive attitude toward life while getting a hearty dose of ornithology, natural history, bird watching and bird watchers, peacocks, conservation ethic, bird banding and bird banders, dealing with people, being dedicated, the benefits of a full life as a "doer". We need more people like Jonnie who can express themselves this sagely, are willing to try new activities, and not be afraid to be themselves and what they are. Thanks for writing this entertaining, useful book! The black and white line drawings by Louise Russell are a valuable adjunct. "The peacocks of Baboquivari" is a fine, fun read.—**Ralph W. Schreiber,** Natural History Museum, 900 Exposition Blvd., Los Angeles, California 90007.

Florida Field Naturalist 14: 82, 1986

Parrots' wood.—Erma J. Fisk. 1985, New York, New York: W. W. Norton and Company, 240 pp. $15.95.—The first time I saw 'Jonnie' Fisk she was standing in a clearing near a central Florida lake with a tiny bundle of kicking, pecking feathers in one hand, banding pliers in the other. I was part of a University of Miami ornithology class. She made short work of us as an interruption. Two days later, at Archbold Biological Station, our group dragged in hot and tired. She offered cold beer all around. I admire someone who has her priorities straight.

The spine of "Parrots' wood" is her most recent ornithological expedition to Belize. Out of this segmented column poke memories and philosophies like ribs, or steps on a ladder to aligned priorities.

On the first page she puts a warm apologetic arm around your shoulder. This is going to be a private but open sharing of Jonnie Fisk with you. Like friends. And she isn't going to be orderly about it.

The tone is conversational and comfortable. She writes economically. When she is sharing a memory, it is written in a whisper. Her philosophies are suggestive, appealing, never imposed. ". . . it is better to pick our flowers and share them with a friend," she writes, "the one who moves in after we're gone may make a parking area out of our garden."

This is a gutsy, witty, funny, sad little book by a gutsy, witty, funny, sad woman. She isn't letting life happen to her. She heaves herself into it. It's the same way she approached bathing in the river on one of her previous journeys to Belize.

It was down a steep muddy bank, she writes. The easiest way to get in was to swing out on a rope and "let go with a mighty splash." Getting out was up the muddy bank.

Like life. Isn't it always?

Since I've read her book, I'll wager when she let go of the rope or "launches (herself) out into chiggers, discomfort, food (she) wouldn't tolerate at home," she mutters Geronimo.

Mrs. Fisk is in her seventies but her book is not for a particular age, it is for a particular attitude.

"Life is a book." she has written. "Its pages empty, or full—of interests, successes, failures, love, adventure."

Her book is delightfully full of all of these, and I recommend, at the very least, letting it happen to you.—**Virginia Rorby Oesterle,** 2901 South Bayshore Drive, Miami, Florida.

Florida Field Naturalisst 14: 83, 1986.

FLORIDA ORNITHOLOGICAL SOCIETY SPECIAL PUBLICATIONS

Species index to Florida bird records in Audubon Field Notes and American Birds volumes 1-30 1947-1976, by Margaret C. Bowman. 1978. Florida Ornithological Society, Special Publication No. 1. Price $4.00.

The Carolina Parakeet in Florida, by Daniel McKinley. 1985. Florida Ornithological Society, Special Publication No. 2. Price $6.00.

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Research certificate, #1	1,772.15	1,986.85
Research certificate, #2	1,400.00	1,400.00
Capital certificate	2,884.97	3,234.47
	$17,505.16	$15,990.08

1985 CASH RECEIPTS AND DISBURSEMENTS

TOTAL FUND BALANCE, 1 January 1985 ..... $17,505.16

Cash Receipts		Cash Disbursements	
Membership dues	$2,915.00	Membership	$179.02
Meetings	3,638.50	Meetings	3,211.56
FFN	692.40	FFN	3,285.23
Interest earned	1,464.19	Special Pub. Fund	3,748.77
Special Pub. Fund	530.00	Special projects	116.00
Research Fund	721.50	Research Fund	300.00
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	$10,008.09	Newsletter	406.53
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Florida Field Naturalist 14: 84-84, 1986.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The Florida Field Naturalist is published quarterly (February, May, August, and November) by the Florida Ornithological Society. It is printed by E. O. Painter Printing Co., P.O. Box 877, DeLeon Springs, Florida 32028. The permanent address of the Florida Ornithological Society is Department of Ornithology, Florida State Museum, University of Florida, Gainesville, Florida 32611.

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

VOL. 14, NO. 4 NOVEMBER 1986 PAGES 85-112

OBSERVATIONS ON COOPER'S HAWK NESTING IN SOUTH CENTRAL FLORIDA

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Abstract.—Four Cooper's Hawk nests in Highlands County, Florida, during 1983-85 constitute the southernmost known breeding records of the species in the state. Two nests in 1983 had three eggs each. One failed before or shortly after hatching, and at least two nestlings reached fledging age in the other. Single nests in 1984 and 1985 had four nestlings each. Laying in the three successful nests was estimated to have occurred during the first or second weeks of April. Observations on the nests, postfledging behavior of young, adult molt and behavior, and prey composition are presented. These nests together with a number of late spring-summer sightings in Charlotte, DeSoto, Glades, Hardee, Highlands, Lee, and Polk counties suggest that there is a substantial resident population in south central Florida and that the Cooper's Hawk may now be a more common breeder in southern Florida than during the 1930's-1950's.

The breeding range of the Cooper's Hawk (*Accipiter cooperii*) in eastern North America is generally regarded as extending southward in the Florida peninsula to about the level of Lake Okeechobee (Snyder 1978). However, there are few well-documented Florida breeding records for the Cooper's Hawk, and knowledge of its breeding biology in the state is limited to a few egg dates and clutch size records and brief descriptions of two nests observed in 1930 (Bent 1937, Hallman 1930, Howell 1932, Sprunt 1952). This paper presents observations on nesting Cooper's Hawks on the Archbold Biological Station, 12 km S of Lake Placid, Highlands County, during 1983-1985. Two nests were found at this locality in 1983 and one each in 1984 and 1985. Late spring-summer records of Cooper's Hawks at other localities in south central Florida are also reviewed.

OBSERVATIONS

Nesting Habitat.—One of the 1983 nests was in a densely-wooded bayhead about 1.3 ha in extent surrounded by open scrubby flatwoods with scattered seasonal ponds. The predominant tree species was loblolly bay (*Gordonia lasianthus*), with scattered slash pines (*Pinus elliottii*) occurring in the drier peripheral areas. The understory consisted of

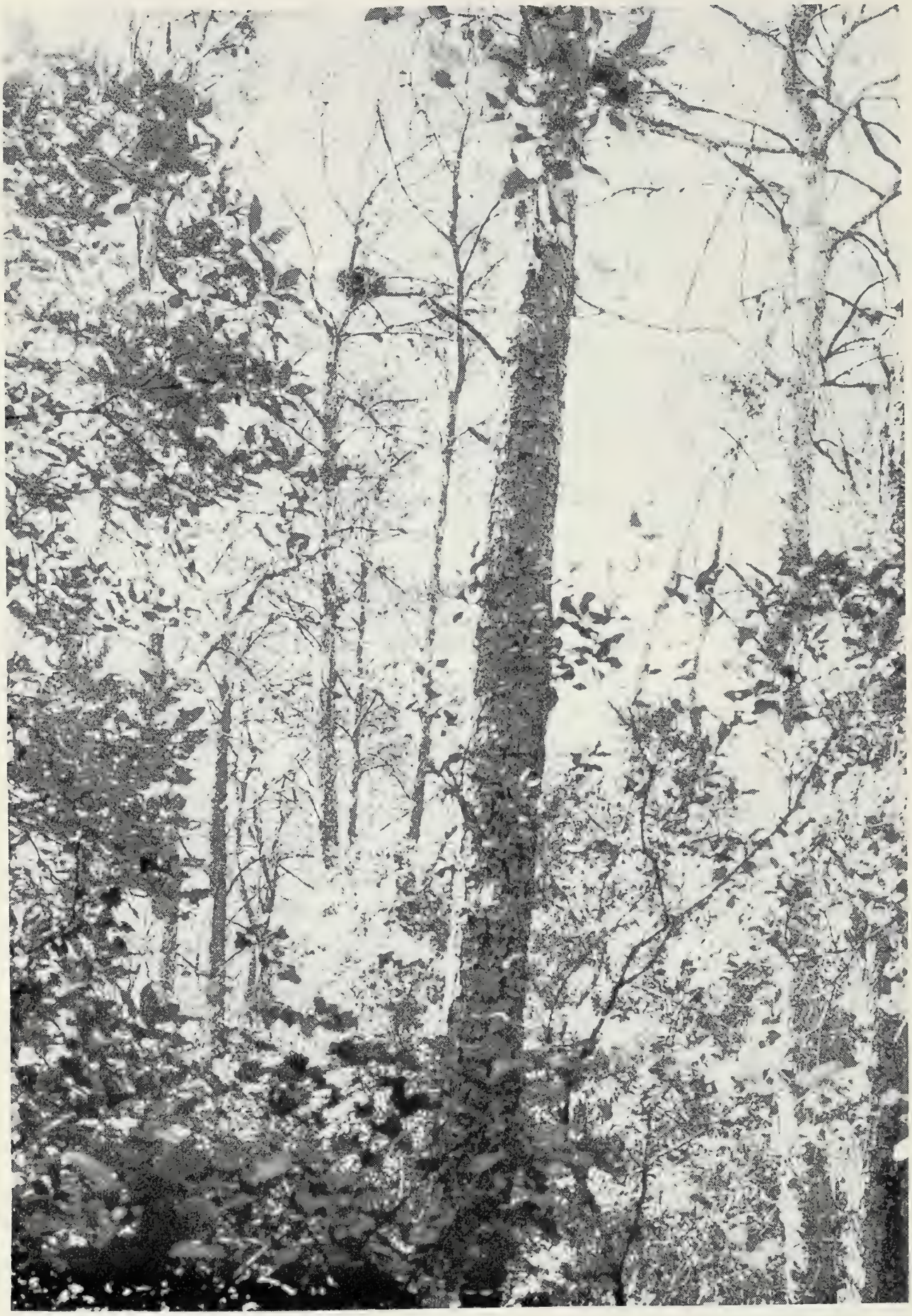

Figure 1. Cooper's Hawk nest in sand pine in mature sand pine scrub, Archbold Biological Station, Highlands County, Florida, 2 June 1984.

dense clumps of saw palmetto (*Serenoa repens*) and ferns. The three remaining nests were in mature sand pine (*Pinus clausa*) scrub 50-170 m from the edge of more open southern ridge sandhill vegetation (Fig. 1). The sand pines were closely spaced, with 50-75 percent canopy coverage. The well-developed understory consisted of oaks (*Quercus myrtifolia, Q. chapmanii, Q. geminata*), palmettos (*Serenoa repens, Sabal etonia*), and other shrubs. More detailed descriptions of the vegetative associations are in Abrahamson et al. (1984). The scrub site in 1983 was approximately 2.5 km from the 1983 bayhead site. The three scrub nests were located in the same general area, suggesting that the same pair of adults was involved for the three years.

The bayhead nest was 10.4 m high in a slash pine with a diameter at breast height (DBH) of 27 cm. The nest tree was located near the edge of the bayhead about 15 m from the border of an open seasonal pond and about 70 m from a wide firelane. The sand pine scrub nests were in sand pines of 13, 29, and 30 cm DBH at heights of 13.0, 13.7, and 11.3 m, respectively. The 1983 nest was within 125 m of a wide, bare sand firelane and 56 m of a woods road. The 1984 nest tree was within 30 m of the same woods road and about 37 m from the firelane; while in 1985 the nest tree was about 18 m from the road and 110 m from the firelane. Distances between the nest trees in different years were: 1983-84, 280 m; 1984-85, 335 m; 1983-85, 76 m.

Description of Nests.—The bayhead nest (Fig. 2) appeared to have been built on top of an old gray squirrel (*Sciurus carolinensis*) nest and was poorly supported by two side branches of the pine and by vines (*Smilax* sp.) growing up the trunk. The nest was built of sticks ranging from about 3 to 10 mm in diameter and had the following dimensions: maximum diameter, 48 cm; minimum diameter, 36 cm; depth, 53 cm; diameter of cup, 20 cm; depth of cup, 9 cm. The three scrub nests were located near the tops of the trees in crotches formed by main branches and were constructed largely or entirely of sand pine twigs. The 1983 nest was in a slightly leaning tree, while the 1984 and 1985 nest trees were straight. Dimensions of the scrub nest in 1984 were: maximum diameter, 58 cm; minimum diameter, 33 cm; depth, 23 cm; diameter of cup, 23 cm; depth of cup, 5 cm. The bayhead nest and the two (1983, 1984) scrub nests examined were lined with thin flakes of pine bark. The cup of the bayhead nest also contained two slightly-dried green leaves when examined on 3 May.

Eggs and Young.—The bayhead nest in 1983 contained three eggs when examined on 3 May. On the following visit, 13 June, it was abandoned. Judging from the absence of droppings on the ground around the nest tree and lack of down adhering to the nest, either the eggs had not hatched or the young had been lost at an early age. The adult female of

Figure 2. Cooper's Hawk nest in slash pine, bayhead habitat, Archbold Biological Station, 4 May 1983.

the 1983 scrub nest was observed incubating during the last week of April, and the nest contained three eggs on 4 May. By the next visit, 26 May, the eggs had apparently hatched, as both adults came in and began to scold and there was more down clinging to the nest. On 17 June, the nest contained two young estimated to be 4-5 weeks of age (Schwabe 1940, Meng 1951). The 1984 nest was discovered on 10 April. The female was incubating when the nest was visited on 25 April. When examined on 2 June, the nest contained four young (two males, two females based on size) 3-4 weeks of age. One of the female nestlings was less developed than the others. On 11 June, the young were in the nest; but the following day three were perched in upper branches of the nest tree or nearby trees and one made a short flight from one tree to another. The less-developed individual was still in the nest. The 1985 nest was found on 21 March, incubation was in progress on 10 April, and heads of downy chicks were seen on 23 May. Four well-developed young (two males, two females) were observed on 11 June. Three were perched on branches near the nest and one was lying down in the nest. Based on an incubation period of 35-36 days (Meng 1951), estimated ages of nestlings, and normal age at fledging of 30 (males) to 34 (females) days (Meng 1951), the eggs of the 1983 scrub nest were laid during the first or second weeks of April and those of the 1984 and 1985 clutches about the first week of April.

Postfledging Behavior of Young.—The most detailed observations on the postfledging behavior of the young were made in 1985. When first out of the nest, the young were quiet and inconspicuous, but within a few days they became highly vocal and could usually be easily located by their calls. The vocalizations included a plaintive *weee-uur* resembling the initial phase of a Red-shouldered Hawk call; a more intense, higher-pitched, squeal-whistle *weee-tsear*, with the emphasis on the second note; and rapidly-repeated *cucks* resembling those of adults but with a mellower quality. The *weee-uur* calls were often given from a perch and would frequently phase into the *weee-tsear* vocalizations, particularly when the bird would take off and begin flying. *Cucks* would frequently follow *weee-tsear* calls. The *weee-uur*, *weee-tsear*, and *cucks* appeared to form a series reflecting an increasing level of excitement.

In 1983 the young remained in the vicinity of the nest and were fed by the adults from the latter part of June until at least mid-July. One of the young in 1985 disappeared, possibly killed by a Great Horned Owl (*Bubo virginianus*), about the time of fledging, as never more than three were seen after 11 June. A patch of feathers believed to be Cooper's Hawk juvenile breast feathers was found in the vicinity of the nest tree. The three surviving young were regularly observed until late July. They remained close to the nest at first, but by the fourth week (5 July) were ranging up to 150 m from the nest. Several days later (8 July) they were observed both in the vicinity of the nest and in an open grassy field with scattered pines and an old grove of ornamental trees about 300 m from the nest site. They spent much of their time in this open area and surrounding open woodland until 17 July, after which they were seen or heard there less regularly. The last time young (a male and female) were seen in the open area was 28 July. An immature male, assumed to be one of the young, was observed on 8 August, about 8 weeks postfledging, 6 km from the nest site. All of the observed movements of the young from the nest site were to the south in the direction of more open habitat.

When in the open field and surrounding woodlands, the young often perched conspicuously in live pines or dead snags and frequently allowed an observer to approach to within 25 m or so. In flapping flight, they appeared to be slower and more buoyant than adults. They often soared for brief periods, particularly during the warmer part of the day. I once observed a young female flying across the oldfield with unusually slow, deep wing beats accompanied by a slight rocking of the body. This may have been the type of flight termed "nighthawk flapping" by Berger (1957). Twice, young were encountered in dense cover close to the ground, and once a male was flushed from a patch of tall grass in the open field. Another time a young female flew toward me as I stood in the field and circled overhead giving *weee-tsear* calls and with her under-

tail coverts flared out, forming conspicuous patches on each side of the base of the tail.

Adults.—Both adults of the 1983 scrub nest and the females in 1984 and 1985 were seen at close range. All were in full adult plumage and had deep red eyes. The male in 1983 appeared to have a darker crown than the female, as is typical. The female of the 1983 scrub nest showed molt in the inner primary area on 25 April and appeared to have one or both central rectrices missing on 26 May. Molted secondary feathers were found in the vicinity of the nest tree on 12 and 15 July. The adult female in 1985 showed no sign of molt when seen at close range on several occasions in late May when the young were well grown.

Only the female was observed incubating. Adults were not aggressive around the nest during incubation, usually remaining out of sight and cackling when an observer approached. After the young had hatched, the adults became bolder in defense of the nest, the female being more aggressive than the male. Only on one occasion, in 1983, did both adults come in close when observers were at the nest; and in this instance the female remained nearer to the nest than the male. On other occasions the male was rarely seen or heard while the female was around the nest. The female would often swoop within 2 or 3 m of an observer on the ground near the nest. She frequently uttered rapid *cucks* when in flight and while perched nearby. Upon landing after a dive at an observer, she usually had her undertail coverts widely flared out. The coverts would return to their normal position within about 10 to 20 seconds if the bird remained perched and did not continue to attack. As noted above, similar fanning out of the undertail coverts was observed in a young female as she circled overhead. Although this display has previously been associated with courtship (Mockford 1951, Beebe 1974, Evans 1982), it appears to occur in other contexts and may be a generalized response reflecting a heightened emotional state. After the young fledged, the adults remained at a distance, occasionally calling. In 1985, neither adult was observed or heard after the young had been out of the nest several days.

Food Habits.—Prey items collected in the vicinity of the scrub nests in 1983 and 1985 after the young had fledged yielded identifiable remains of ten species of birds and two species of mammals. The species and minimum number of individuals included: Blue Jay (*Cyanocitta cristata*) 7, Mourning Dove (*Zenaida macroura*) 5, Northern Bobwhite (*Colinus virginianus*) 4, Northern Mockingbird (*Mimus polyglottos*) 2, Brown Thrasher (*Toxostoma rufum*) 2, Common Grackle (*Quiscalus quiscula*) 2, Chuck-will's-widow (*Caprimulgus carolinensis*) 1, Rufous-sided Towhee (*Pipilo erythrophthalmus*) 1, Common Ground-dove (*Columbina passerina*)1, Northern Flicker (*Colaptes auratus*) 1, cottontail rabbit

(*Sylvilagus floridanus*) 1, black rat (*Rattus rattus*) 1. In addition, an adult was observed carrying a small mammal, probably a cotton rat (*Sigmodon hispidus*). One of two castings found, presumably from the young, contained numerous insect remains in addition to small feathers and hair. The abundance of insect parts seemed too great to be explainable as accidental or secondary ingestion, suggesting that the young had deliberately fed on insects. The young male that was flushed off the ground in the oldfield may have been foraging for insects. Fitch et al. (1946) reported a recently-fledged young chasing grasshoppers on a lawn.

Additional Evidence of Breeding

Sightings of Cooper's Hawks on the Archbold Biological Station during the summer months after the spring and before the fall migration periods suggest additional occurrences of breeding in this region. On 29 August 1968, an adult was observed in the vicinity of the main station buildings. An adult, probably a male, carrying a Northern Bobwhite was flushed from a dense oak thicket on 13 June 1969; and a recent fledgling was observed on 6 June 1982. On 28 August 1984, an individual, probably a female, was seen flying into a dense pine stand several kilometers from the known nest site that year. This suggests the possibility of a second nest in 1984, although by late August the adults or young of the known nest could easily have dispersed that far.

In the period 1971-85, I observed presumably summer resident Cooper's Hawks on 13 occasions in other sections of Highlands County and in Charlotte and Glades counties on the following dates: Highlands County—26 July 1971, 9 July 1979, 12 July 1979, 16 July 1979, 11 August 1979, 23 June 1981, 9 July 1981, 15 June 1983, 31 July 1984, 20 August 1984, 26 June 1985; Charlotte County—8 May 1975; Glades County—7 July 1974. The Glades County sighting was of an individual with tail molt in progress, further indicative of a resident adult. A rough index of the relative abundance of Cooper's Hawks in this three-county area in summer and winter is provided by the numbers of casual sightings in the two seasons recorded in my field notes from 1968 to 1985. Of a total of 92 sightings (not including those of known nesting individuals), 17 (18 percent) were in May (1), June (4), July (8), and August (4) and probably represent resident birds. These figures suggest the presence of a significant breeding population augmented by a marked influx of migrants in winter. The following published records further substantiate the regular occurrence of Cooper's Hawks in south central Florida in late spring and summer: DeSoto Co.—7 July 1981 (H. M. Stevenson in Paul 1981); Glades Co.—4 August 1981 (J. Cox in Paul 1982), 17 May 1982 (G. E. Woolfenden in Paul 1982); Hardee Co.—18 June (Stevenson 1966); Highlands Co.—19 June 1966 (J. C. Ogden in Stevenson 1966), 25 June 1967 (J. C. Ogden

in Stevenson 1967), 4 July 1971 (Ogden 1971); Lee Co.—27 July 1976 (D. B. Freeland in Ogden 1976); Polk Co.—3 June 1960 (Stevenson 1960), 24 May 1981 (Kale 1981).

Discussion

The two previously described Florida Cooper's Hawk nests were located near Gainesville, Alachua County (Howell 1932), and on Anastasia Island, St. Johns County (Hallman 1930). The Alachua County nest was in an oak at a height of about 15 m. It was poorly-constructed and lined with "a quantity" of green pine needles and green oak leaves. The Anastasia Island nest was in a grove of hardwood trees adjacent to a salt marsh. It was about 5 m high in a small oak and was composed of small sticks and lined with small pieces of pine bark. J. C. Ogden (pers. comm.) observed a nest 50 ft. (15.2 m) high in a pine in Franklin County in 1964.

On the basis of presently fragmentary knowledge, the breeding biology of the Cooper's Hawk in Florida appears to be generally similar to that elsewhere in the range as described by Beebe (1974), Bent (1937), Evans (1982), Fitch et al. (1946), Hemphill (1966), Henny et al. (1985), and Meng (1951). One aspect of the behavior of the Florida young and adults apparently not previously reported is the flaring of the undertail coverts under conditions not associated with courtship. The available data also suggest that clutch size in Florida may average lower than elsewhere in the range. The mean of four clutches (Hallman 1930, 1945; present study) is 3.00 (3.33 if the two broods of four young recorded on the Archbold Station in 1984 and 1985 are included). Howell (1932) gave 3 or 4 as the usual clutch. In comparison, Henny and Wight (1972) reported 4.18 as the average clutch size over the U.S. as a whole. Nesting appears to begin earlier in Florida than farther north, although the difference in timing is not as great as might be expected. Estimated laying in the three scrub nests (27° N lat.) was the first or second weeks of April. Howell (1932) noted eggs found at Orlando on 4 April, 19 April, and 3 May. The nest on Anastasia Island recorded by Hallman (1931) had three eggs on 4 May, and another at Panama City, Bay County, had eggs on 12 May (Sprunt 1952). The Franklin County nest observed by J. C. Ogden (pers. comm.) on 11 April 1964 had an adult working on the lining but otherwise appeared to be complete. Bailey (1925) gave 1-20 May as the period of occurrence of fresh eggs, but it is questionable if this statement refers specifically to Florida nests. In comparison, dates of the first egg in upstate New York (43° N lat.) ranged from 22 April to 6 May (Meng 1951). Of egg dates given in Bent (1937), 50 percent of those for northern localities (New England, Ohio, Minnesota, Canada) fell between 29 April and 21 May; while 48 percent for Lower California and Florida ranged from 15 April to 17 May.

Howell's (1932) distribution map for the Cooper's Hawk in Florida showed ten breeding sites, the southernmost being Manatee, Manatee County. Bent (1937) listed St. Marks, Branford, Micanopy, Orlando, and Manatee as breeding localities. Baynard (1942) reported breeding at Hillsborough River State Park, Hillsborough County. Sprunt (1952) added an additional locality, Panama City, Bay County, and noted that he had never observed nor heard of any nesting in the vicinity of Okeechobee in south central Florida. More recent localities of reported nesting or circumstantial evidence of nesting in the state include: eastern Franklin County in 1964 (J. C. Ogden in Cunningham 1964); Gainesville area, Alachua County, in 1972 (C. H. Coleman et al. in Ogden 1972); and the vicinity of Lake Panasoffkee, Sumter County, in 1973 (G. E. Woolfenden in Ogden 1973). Thus, the Highlands County nests in 1983-85 constitute the southernmost known breeding record of the Cooper's Hawk in Florida. These documented cases of nesting together with the number of late spring and summer sightings of Cooper's Hawks in Charlotte, DeSoto, Glades, Hardee, Highlands, Lee, and Polk counties suggest that breeding has occurred regularly at the southern boundary of the range during the past 20-25 years.

Howell (1932) stated that the Cooper's Hawk was a rather uncommon resident in Florida and appeared to be most numerous in the northern part of the state. Sprunt (1952) did not alter this assessment. Some indication of the status of the Florida breeding population in more recent years is provided by records published in Audubon Field Notes/American Birds from 1960 to 1985. Of 29 sightings in the May-August period (excluding two from the Dry Tortugas in May 1978 and 1979), 13 were in six counties (DeSoto, Glades, Hardee, Highlands, Polk) in the southernmost part of the breeding range compared with 16 from the remainder of the state. Even allowing for a possibly higher probability of reporting of occurrences of Cooper's Hawks in summer in peninsular compared with north Florida, the distribution of these records suggests that there has been a relative or absolute increase in the resident population in the southern part of the state since the 1930's-1950's. The known or probable nest records and sightings of presumed residents from 1960 to the present cited above also indicate that there has been no significant change in the Florida breeding range from that given by Howell (1932) and Sprunt (1952).

The evidence that the Cooper's Hawk still maintains its historic breeding range in Florida and apparently has become a more common breeder in the southern part of the state during the past 25 years is encouraging in view of its severe decline elsewhere in eastern United

States during 1946-1967, presumably as a result of pesticide contamination (Henny and Wight 1972), and its continuing low population level (Arbib 1977). The potential importance of Florida both as a wintering and breeding area for the Cooper's Hawk in eastern United States points to the need for additional research on its distribution, numbers, habitat requirements, and other aspects of its life history and ecology in the state.

Acknowledgments

I thank Holly Tuck, Chester Winegarner, and Fred Lohrer for help in locating nests; Holly Tuck for aid in banding young; Petra Wood for bibliographic assistance; Glen E. Woolfenden for help in identifying prey remains; Dean Amadon, Petra Wood, David R. Smith, and John C. Ogden for helpful comments on the manuscript; and Dorothy Carter for typing the manuscript.

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NOTES

Observation of the feeding of Black-throated Blue Warblers in Florida during migration.—During the spring and fall migrations in 1984 and 1985, I observed Black-throated Blue Warblers (*Dendroica caerulescens*) feeding in Ft. Pierce Inlet State Recreation Area on North Hutchinson Island in St. Lucie County, Florida. Three times they appeared to be plucking insects from spider webs, and three times they were eating the fruit of beautybush (*Callicarpa americana*). At Sebastian Inlet State Recreation Area, Indian River County, Florida a bird was eating the fruit of wild balsam apple (*Momordica charantia*).

On 20 April 1984, I observed a male bird that appeared to be feeding on insects from the web of a crablike spiny orb weaver (*Gasteracantha elipsoides*) about 2 m high in a redbay tree (*Persea borbonia*). He flew up to the web twice, each time appearing to remove something from the web as he hovered facing it. Each time he then flew to a nearby twig, perched, and appeared to swallow. About 1900 h of 9 May 1984 a male bird was observed in live oaks (*Quercus virginiana*) about 3 to 5 m from the ground. He sat on small branches near each of two webs of golden-silk spiders (*Nephila clavipes*) having spiders in the centers. He appeared to be picking insects from the outer portions of the webs. Similarly, on 9 September 1984, I observed a male bird in saw palmettos (*Serenoa repens*) flying from the ground and picking at the web of a golden-silk spider about 1 m from the ground.

On 30 September 1984 about 50 birds were seen, some feeding on beautybush fruits. The next day two birds were observed for 15 to 20 minutes at about 1000 h in a clump of beautybushes. A female flew to a cluster of fruit and impaled one on her bill. She then perched with her bill held up at a 45° angle and appeared to be working her lower mandible inside the fruit before swallowing. She discarded the remaining part of the fruit. This process took 8 to 12 seconds, and was repeated until ten fruits were eaten in succession. After a pause she ate five, paused, then ate four. A male was in the back of the shrubs and was seen only occasionally. He seemed to be using the same technique, but once he consumed the whole fruit except for about one-quarter of the skin. At the conclusion of the observation, I examined the remnants on the ground. The fruits had holes in one side and were collapsed, with the seeds and a small portion of the pulp remaining. In previous years these warblers have been observed feeding on the fruits of rouge plant (*Rivina humilis*), but on this occasion fruits of two nearby plants of that species were not used. On 9 September 1985 a male bird was observed for four minutes. He seemed to be foraging for insects in twigs and vines, but spent one minute eating five beautybush fruits in the manner described above.

At 1130 h of 14 October 1985 at Sebastian Inlet State Recreation Area, a male bird was observed in a thicket of Brazilian pepper (*Schinus terebinthifolius*) and cabbage palms (*Sabal palmetto*) entwined with wild balsam apple vines. Three times he plucked a seed with its fleshy red covering from the wild balsam apple and retired into the thicket, apparently to eat it.

The food of the Black-throated Blue Warbler is reported to be mostly insects with occasional seeds and berries (Griscom and Sprunt 1957, Bent 1953). Both of these sources quote a 1916 study of the stomach contents of these warblers in Puerto Rico by Alexander Wetmore as showing 75.7% animal and 24.5% vegetable matter. Forbush (1929) stated that these birds "catch many insects on the wing" and feed "largely on moths, caterpillars including the hairy tent caterpillar, flies, beetles, and plant lice." Terres (1980) included the preceding and added "aphids, also seeds and fruits". Imhof (1962) listed dragonflies, winged ants, locusts and "occasionally slugs and seeds".

These observations indicate that Black-throated Blue Warblers as they pass through Florida seem to use some of the fruits available in the state during the fall and have found an easy source of insect food in spider webs.

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Florida Field Naturalist 14: 96-97, 1986.

Case of botulism in Laughing Gulls at a landfill in the Virgin Islands, Greater Antilles.—On 24 May 1984, I was called to the scene of 176 dead Laughing Gulls (*Larus atricilla*) at a landfill located at the western border of the Mangrove Lagoon, St. Thomas, U.S. Virgin Islands. Four of the dead gulls (2%) had been banded as chicks at colonies within 3 km of the site. The mean age of these gulls was 4.8 years (4, 4, 4, 7 yrs). It was not known whether these birds were breeding, but within two days three additional birds, apparently suffering from the same condition, were found at three colonies. None of the birds at the landfill or colony sites had been touched prior to my arrival, and virtually all were laying in the same position, as if they had fallen asleep resting on their breast. Feathers of the vent were matted and stained green, and the abdomen was filled with gas, as described by Austin and Austin (1931, Auk 48: 195-197).

Blood samples from five gulls from the landfill sent to the National Wildlife Health Laboratory, Madison, Wisconsin, were found positive to botulism type C (Dr. R. K. Stroud pers. comm.).

In the Virgin Islands, Laughing Gulls nest in early May, and hatching begins by late May and early June (pers. observ.). It appears that loss of a parent might affect survival of offspring in that chicks might suffer interrupted incubation, abandonment, or starvation because a single parent would have difficulty brooding and feeding two or three hatchlings. In that all the dead gulls were in definitive breeding plumage, it is possible that as many as 440 eggs or chicks (based on mean clutch size 2.5 in 179 nests in the colony, pers. observ.) may have been affected.

The St. Thomas landfill in May contained much organic refuse which was continuously turned over by bulldozing. Birds had been found dead at this site previously (E. Gibson, Public Works Dept., pers. comm.).

I wish to thank J. A. Kushlan, J. A. Rodgers, and an anonymous reviewer for may helpful comments and suggestions for improving this manuscript, R. K. Stroud and the National Wildlife Health Lab for their assistance, the Division of Fish and Wildlife, Dept.

of Conservation and Cultural Affairs, St. Thomas, USVI and in particular Pittman-Robertson Wildlife Restoration Federal Aid, FW-3 Grant-in-aid support from U.S. Fish and Wildlife Service, Atlanta, Georgia.—**Robert L. Norton**, P.O. Box 243, Cruz Bay, St. John, USVI 00830 (former address—Div. of Fish and Wildlife, 101 Estate Nazareth, St. Thomas, USVI 00830).

Florida Field Naturalist 14: 97-98, 1986.

Occurrence of a double brood in Red-headed Woodpeckers in south central Florida.—Double broods in North American woodpeckers are known only in the genus *Melanerpes*. The species for which second, and occasionally third, broods have been recorded or suspected include the Red-headed Woodpecker (*M. erythrocephalus*), Red-bellied Woodpecker (*M. carolinus*), Gila Woodpecker (*M. uropygialis*), Golden-fronted Woodpecker (*M. aurifrons*), and Acorn Woodpecker (*M. formicivorus*) (Bent 1939, Breitwisch 1977, MacRoberts and MacRoberts 1976, Reller 1972, Skutch 1969). Well-documented cases of double broods are rare. We here present evidence of a double brood in the Red-headed Woodpecker in south central Florida. Although Breitwisch (1977) reported double broods in Red-bellied Woodpeckers in extreme south Florida, there appear to be no previous recorded cases of double brooding in Florida Red-headed Woodpeckers.

A pair of Red-headed Woodpeckers nesting on the Archbold Biological Station, 12 km S of Lake Placid, Highlands Co., Florida, fledged two broods of young in 1985. The nesting territory was a 4-ha old field with widely scattered live slash pines (*Pinus elliottii*) and dead pine stubs surrounded by slash pine-turkey oak (*Quercus laevis*) woodland. The male of the pair was color-banded and is known to have nested in the same area for the previous three years. In 1985, the pair was first observed on the territory on 20 April, at which time the male was excavating a cavity in a dead pine stub. During the week of 27 May only one adult was seen, suggesting that incubation was in progress. On 11 June the adults were feeding young in the nest cavity, and on 25 June one recent fledgling was observed with the adults near the nest tree. The young was still present in the territory on 25 July. On 6 September the adults were feeding two young of a second brood in a dead pine approximately 150 m from the first nest stub. An older immature bird, presumably the young of the first brood, was also in the territory. One of the second brood fledged between 19 and 20 September, and both were observed with the adults in the vicinity of the nest stub four days later. Assuming average incubation and nestling periods of 14 days each (Bent 1939), the second clutch was probably laid sometime during the third week of August. Both adults, the recent fledglings, and the older juvenile remained in the territory through 7 October. On that date, the adults were still feeding the young of the second brood. The older immature was pursued by both adults but persisted in remaining in the territory. One adult and the two second-brood young, still giving food-begging calls, were observed on 14 October. On 16 October only an adult and the old immature were present. No adults were seen after this date, but the old immature remained until 29 October. By this date, it was beginning to show red feathers on the back of the head, indicating that the prebasic molt had begun.

The male of the pair was color-banded as an adult by Lilian Saul in May 1982 in the same territory and is known to have had a minimum of two mates since that time. The female in 1982 was also banded, whereas those in 1983, 1984, and 1985 were unbanded. No observations on nesting were made in 1982, but the pair was present in the territory from 11 May to 20 September. In 1983, the adults arrived about 9 May (copulation was also observed on this date), fledged two young, and departed between 20 September and 4 October. In 1984, a pair was first seen on the territory on 11 April and fledged two young

during the period 11-19 June. An immature was still present on 8 October. In comparison with earlier years, the pair arrived later in 1985 than 1984, but the timing of the first brood was similar. The fall departure was later than the previous three years, presumably as a result of rearing the second brood. As in 1984, an immature remained on the territory after the adults had left. The major factor contributing to the production of the second brood in 1985 may have been an unusually good food supply in late summer and early fall, with the result that the adults were in a better nutritional state and better able to feed a second brood than in a typical year. Myrtle oak (*Quercus myrtifolia*), the dominant oak in the surrounding woodlands, produced an unusually heavy acorn crop in 1985 (126% and 280% above 1983 and 1984 levels, respectively; unpubl. data), and the adults fed heavily on acorns from the shrubs bordering the field from early September on. August and September 1985 were relatively dry (monthly rainfall 36% and 19% below average, respectively) and it is also possible that insects were more abundant or active during this period than in wetter years. The reduced energetic cost to the adults of raising only a single young in the first brood may also have contributed to the successful production of the second brood.

Apparently the only previous specific records of double-broods in Red-headed Woodpeckers are those of Potter (in Bent 1939) and Reller (1972). The former observed a pair in New Jersey that fledged young on 25 June and again had young in the nest on 30 July, at least a month earlier than the second set of young appeared in our study. As in the Florida case, Potter also observed adults chasing the young of the first brood. Reller (1972) found that at least 3 of 15 pairs of red-heads studied in lllinois nested a second time, some while still feeding fledglings from the first brood.

The apparent restriction of multiple broods in North American woodpeckers to members of the genus *Melanerpes* may reflect the more omnivorous diet of this group compared with other woodpeckers. The ability to utilize fruits or acorns in addition to insects increases the potential energy sources that can be allocated to reproduction. It thus may be more than coincidence that both multiple broods and cooperative breeding occur in melanerpine woodpeckers, as the ability to utilize acorns as food was a key factor in the evolution of cooperative breeding in the Acorn Woodpecker (MacRoberts and MacRoberts 1976).

Acknowledgments

We thank Lilian Saul for supplying information on the color-banded male and Fred E. Lohrer for helpful comments on the manuscript.

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Dolphin interferes with loon.—On 6 December 1985, my group was watching a Common Loon (*Gavia immer*) fishing close to shore off the northwest point of Mullet Key, Florida. A bottlenose dolphin (*Tursiops truncatus*) appeared and began to play with or tease the loon. When the loon dove, the dolphin would push it to the surface with its nose, sometimes lifting the loon clear of the water. Several episodes took place over a period of about four minutes. Suddenly the loon raised its body to a vertical position, flapped its wings, and called loudly, an unusual occurrence in Florida. The dolphin departed, and the loon continued fishing.—**Oliver H. Hewitt,** 24437 Harbor View Road, Charlotte Harbor, Florida 33950.

Florida Field Naturalist 14: 100, 1986.

Florida Grasshopper Sparrow breeding distribution and abundance in 1984.—Early reports, although vague, indicate a relatively large and widespread population of Florida Grasshopper Sparrows (*Ammodramus savannarum floridanus*) existed in central peninsular Florida (sources cited in Delany et al. 1985). A review of information on Florida Grasshopper Sparrow egg data slips in museum collections revealed additional locations (McNair 1986). More recent searches have failed to locate Grasshopper Sparrows or revealed only isolated pairs or individuals (Stevenson 1968, 1978; Ogden 1971). Because of an apparent population decline, the subspecies was classified as endangered by the State of Florida (Kale 1978). Extensive surveys between 1980-82 located only 93 Florida Grasshopper Sparrows at seven sites (Delany et al. 1985). The sparrow was found at only one of its former locations, suggesting further reduction in both abundance and occupied range. Because of a decline in abundance, contraction of range, and loss of habitat, the Florida Grasshopper Sparrow is being considered for Federal listing as endangered (Federal Register Vol. 50, No. 243). As part of a status survey, additional searches were conducted in 1984 to gather more information on the sparrow's distribution and abundance. This paper reports 1984 survey results.

Surveys were conducted in the dry prairie region of south-central Florida within the known range of the Florida Grasshopper Sparrow. Eight unsearched areas identified as potential Grasshopper Sparrow habitat in 1982 and six previously searched areas (Delany et al. 1985) were surveyed between 30 April and 30 June 1984. Surveys were conducted between sunrise and 1300, by one to three individuals who walked transects at 50-m intervals, stopping frequently to make visual and auditory observations. Eighty-six man-hours were spent walking transects in potential Grasshopper Sparrow habitat. Where sparrows were found, information was obtained on population size and current land management practices. We watched singing males in order to detect the presence of non-singing birds, probably females, and juveniles nearby. Information pertaining to recent and planned activities at other occupied areas also was obtained.

The survey in 1984 located 109 Florida Grasshopper Sparrows at six former locations and one new site (Figure 1, Table 1). At all sites except for Avon Park (site 7), the sampling effort was similar to previous surveys. Our lower count for the United States Air Force (USAF) bombing range at Avon Park was caused by reduced sampling effort. This site was intensively searched in 1982.

Thirty-two sparrows (site 8) were found at a former location 24 km northwest of Bassinger, Okeechobee County (Howell 1932), that was unoccupied in 1982 (Delany et al. 1985). The new site (4) may be the location where W. H. Nicholson collected eggs on 13 May 1947, near Highway 60 in Osceola County (McNair 1986). Present land use trends at some sites

Table 1. Bird numbers at all known locations occupied by Florida Grasshopper Sparrows, 1984. Numbers found during previous surveys (1980-82) are in parentheses.

Site	Location	Adults ♂	Adults ♀	Juvenile	Unknown
1	Osceola County, 21.1 km southwest of Kenansville (T31S, R32E, Sec. 14).	5(1)	3		
2[1]	Osceola County, 13 km southwest of Kenansville (T31S, R33E, Sec. 21).	(3)			(1)
3	Osceola County, Three Lakes Wildlife Management Area (WMA), 16.7 km west of Kenansville (T30S, R32E, Sec. 19).	26(2)	9(2)	(3)	2
4[2]	Osceola County, east of Peavine Trail at SR 60 (T31S, R33E, Sec. 34).	4			
5	Glades County, Lykes Brothers Ranch, 11 km west of Palmdale (T40S, R29E, Sec. 33).	4	1		1(2)
6	Glades County, Lykes Brothers Ranch, 16 km west of Palmdale (T41S, R28E, Sec. 3).	1(1)			
7	Highlands and Polk counties, Avon Park Bombing Range (USAF), 22 km east of Avon Park (T33S, R30E, Sec. 3).	14(42)	5(18)	2(9)	
8[3]	Okeechobee County, 26 km south of SR 60, along the Peavine Trail (T33S, R33E, Sec. 29).	22	5		5
9[1]	Okeechobee County, 13.5 km northwest of Bassinger (T34S, R32E, Sec. 33).	(5)	(3)	(1)	

[1]Not searched in 1984
[2]New location
[3]Former location (Howell 1932) unoccupied in 1982 (Delany et al. 1985)

indicate continued loss of habitat for *floridanus*, as dry prairie is converted to improved pasture and farmland (Table 2). Habitat in search areas where Grasshopper Sparrows were not found in 1984 appeared similar to occupied areas described by Delany et al. (1985).

When survey results for 1984 are combined (avoiding duplication of sites) with data from previous surveys (Delany et al. 1985), 182 Florida Grasshopper Sparrows were located during four breeding seasons (1980-84). Of the 172 adults found, 119 were males. If each singing male was mated to a single female, the total population would be 238 adults, which probably represents a minimum estimate of the total population size. All occupied sites are indicated to provide specific locations for breeding Grasshopper Sparrows. It is possible

Figure 1. Florida Grasshopper Sparrow locations, 1980-82 (from Delany et al. 1985) and 1984. Site number (from Table 1) is indicated.

Table 2. Land management activities at locations occupied by Florida Grasshopper Sparrows, 1984.

Site	Recent and planned activities	effect on sparrow
1	Controlled burning every 2-3 years. Light grazing, one animal unit per 2 ha.	Habitat will probably be maintained.
2	Same as in #1.	Habitat will probably be maintained.
3	Grazing lease until 1986. From 450-600 animal units on 5,400 ha. Prescribed burning Nov.-Feb., maximum area 121 ha.	Habitat will probably be maintained.
4	Unknown. Recently chopped.	Unknown.
5	Chopped in 1984. Plan to plant non-native grasses. Converting site to improved pasture.	May become unsuitable.
6	Farming planned.	May become unsuitable.
7	Prescribed fire every 3 years. Lightly grazed.	Habitat will probably be maintained.
8	Prescribed fire every 3 years. Lightly grazed. No changes planned.	Habitat will probably be maintained.
9	Grazed, 1 animal unit per 8 ha. Pasture not burned since 1979.	May become unsuitable.

that sites 1-4 are indeed a single site, and the location southwest of Kenansville (Osceola County) described by Howell (1932) and Nicholson (1936). Movement patterns of Florida Grasshopper Sparrows are not known. No surveys were conducted in 1985.

Many of the nine localities found since 1980 are managed as cattle pasture by prescribed burning. Burning generally improves Grasshopper Sparrow habitat by maintaining vegetation in a structurally simple, early successional stage (see Delany et al. 1985). Florida Grasshopper Sparrow densities appeared to be lower in areas not burned within 2.5 years. Grasshopper Sparrows were found in two pastures (sites 4 and 5) in 1984 that were roller chopped, i.e., mechanically cleared, within the previous three months. Chopping also greatly reduces vegetative cover and, in some cases, may be an alternative to burning when managing sparrow habitat. Florida Grasshopper Sparrows probably move from pasture to pasture within a locality in response to management activities as habitat improves or deteriorates.

Current information indicates the Florida Grasshopper Sparrow qualifies for Federal endangered status, and effective 2 September 1986, the Florida Grasshopper Sparrow was classified as endangered by the U. S. Fish and Wildlife Service. No critical habitat was designated, and such designation may be difficult because suitable areas appear to be ephemeral because of plant succession. It appears that burning every 2-3 years is beneficial in maintaining suitable habitat for Florida Grasshopper Sparrows. However, additional information is needed on habitat correlates of abundance and the effect of prescribed fire relative to pine (*Pinus* sp.) invasion. Additional surveys are needed to determine distribution more thoroughly. Considerable information on Florida Grasshopper Sparrow breeding biology, survival, dispersal, and winter habitat use also is needed before the effects of land management activities can be fully assessed.

Acknowledgments

Surveys conducted in 1984 were supported by Cooperative Agreement No. 14-16-0009-1544, Research Work Order 14, funded by the United States Fish and Wildlife Service, Jacksonville Endangered Species Office through the Florida Cooperative Fish and Wildlife Research Unit. We are grateful to M. Bentzien and H. F. Percival who effectively promoted this effort. The Florida Game and Fresh Water Fish Commission provided administrative assistance. C. R. McCracken and H. Barker participated in surveys. P. F. Ebersbach and J. L. Paridiso contributed ideas to the the discussion of habitat use. We thank A. L. Adams, P. Clemons, C. P. Lykes, P. T. Wilson, and the United States Air Force for providing land management information and access to their properties. The helpful comments of P. F. Ebersbach, D. S. Maehr, D. B. McNair, and J. A. Rodgers, Jr. on an earlier draft of this manuscript are gratefully acknowledged. T. L. Crown typed drafts of this manuscript.

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Florida Field Naturalist 14: 100-104, 1986.

Eurasian Collared-Doves collected in Florida.—In November 1985, while vacationing at Islamorada, Monroe Co., Florida, the senior author stopped to watch a group of about 80 "ring-necked" doves (as they are widely known among aviculturalists) *Streptopelia* sp. which were visiting a groundfeeder off U. S. 1 in the neighborhood where one was first reported on 30 December 1980 (W. B. Robertson in Sprunt 1981). Prompted in part by a recently published note by Yank and Aubry (1985) as well as by his own experience in Europe, Smith studied these birds at length and concluded that they appeared to satisfy the size and plumage characteristics of the Eurasian Collared-Dove *Streptopelia decaocto*. About the shape but slightly larger than a White-winged Dove *Zenaida asiatica* and much larger, paler, and more square-tailed than a Mourning Dove *Zenaida macroura*, these birds possessed such subtleties of plumage that it was difficult to describe them adequately. They were pale grayish sandy brown, somewhat lighter and more pinkish gray on the head, neck, and underparts than on the back and mantle with a black half-ring on the hindneck, which in many individuals seemed to be superimposed on a wider white ring. Significantly, the pinkish gray color of the underparts was essentially uniform to and including the undertail coverts. From below, the basal half of the tail was brownish black, with the remainder a shade of grayish white. However, when the birds were at rest, the tail appeared to be nearly uniform in color with the back, often showing little or no white. The

color of the primaries was browner, particularly above, than was the color of the remainder of the wing.

Kale first noted similar doves, which may have been present in the area earlier, nesting along with White-winged Doves in a nursery a few blocks west of Krome Ave. (S. R. 27) in Homestead, Dade Co. Florida, in the spring of 1982. In January 1986, Smith was watching some of their burgeoning numbers nearby when he finally heard one give a clearly trisyllabic, unrolled "kuk-kooooooo'-kook" call, ruling out the possibility that it was any form of the so-called Ringed Turtle-Dove *Streptopelia 'risoria'* (hereinafter referred to as the Domestic Collared-Dove), which shares the rolling, essentially bisyllabic "kooeek-krrrroooooo(aw)" call of the African Collared-Dove *Streptopelia roseogrisea* and now generally is considered to have descended from it (Vaurie 1961, Chappuis 1974, Goodwin 1983, Cramp and Simmons 1985). Frivaldszky, in describing *decaocto* in 1838, named it onomatopoeically based upon a Greek legend about a dove's call (as recounted by Fisher 1953); Shelley (1883) believed that *roseogrisea* was the parent species of '*risoria*'; and Hartert (1916) discussed similarities between *roseogrisea* and '*risoria*' while emphasizing the difference in vocalizations between '*risoria*' and *decaocto*. Nevertheless, many early ornithologists (and even some modern ones, reflected in A.O.U. 1983) were less certain or had different opinions as to the relationships between these taxa. Peters (1937), for example, treated *decaocto* as the parent species of '*risoria*' while others considered *decaocto* and *roseogrisea* (and hence '*risoria*') to be conspecific (*fide* Vaurie 1961). Thus, the literature abounds with nomenclatural inconsistencies, sometimes rendering it difficult to discern correctly the status or characteristics of a given population.

The problem of identification is compounded by the fact that the Domestic Collared-Dove has been the object of hundreds of years of aviculture, and considerable variation now occurs in its plumage and measurements (Goodwin 1983). A common form, often called the Blond Ringdove by aviculturists, has been marginally established in Los Angeles, California since at least 1929 (Grinnell 1929) and in St. Petersburg, Pinellas Co. Florida, since at least 1953 (Sprunt 1954). It is a bit smaller and is more creamy (usually lacking in grayish or pinkish tones) than the Eurasian Collared-Dove, with a white belly and undertail coverts and often with a noticeably white tip to the upper side of the tail when at rest. While this is the form usually depicted in field guides as the Barbary or Ringed Turtle-Dove, Smith has seen ones in certain aviaries and petshops in Florida, all giving similar vocalizations, but differing widely in size and ranging in plumage from the darker parent type (i.e. like *roseogrisea*) to pied to all white (either with or without a hindneck ring). Most are raised locally and appear currently to be sold mainly to young couples for release at their weddings(!). However, Goodwin (1983) points out that the fear of strange or moving creatures seems to have been bred out of '*risoria*', and consequently it has failed to establish a viable, expanding wild population anywhere in the world despite numerous releases.

To be certain of the identity of the *Streptopelia* doves multiplying rapidly in south Florida, Kale collected four individuals on 30 April 1986 from the population at Florida City near Homestead (Table 1). The study skins were brought to the American Museum of Natural History in New York by Smith, where they were compared to a large series of all 16 species of *Streptopelia*. Here, their identity as *Streptopelia decaocto decaocto* was confirmed. In addition to *decaocto*, eight other species of *Streptopelia* doves occurring in Africa or the orient possess dark hindneck rings. Four of these, the Cape Collared-Dove (*S. capicola*), the Vinaceous Collared-Dove (*S. vinacea*), the White-winged Collared-Dove (*S. reichenowi*), and the Red Collared-Dove (*S. tranquebarica*), all are much smaller than *S. decaocto*, or are otherwise very distinctive in plumage. The Javan Collared-Dove (*S. bitorquata*) is similar in size and color but has a scaly irridescent hindneck ring that flares at the sides as well as a whitish vent and more extensively dark undersides to the tail. The Red-eyed Collared-Dove (*S. semitorquata*) is much darker in overall colortone. Individuals

Table 1. Measurments of *Streptopelia* doves collected 30 April 1986 at Florida City, Florida.

#	Sex	Total Length	Right Wing	Tail	Weight
390	F	298 mm	180 mm	138 mm	173 g
391	F	304	168	134	180
392	F	286	167	137	160
393	M	291	178	141[1]	173

[1]Measured by P. William Smith after preparation; all other measurements by H. W. Kale before preparation.

of natural populations of the African Collared-Dove are smaller, especially in tail measurements, slightly paler, have a white vent, more extensively white outer tail feathers, and often show a white tip to the tail at rest when viewed from above. The nominate race of the Mourning Collared-Dove *(S. decipiens)* seems to be the most similar in size and plumage to *S. decaocto,* differing mainly in having a more deeply pink neck contrasting with a gray occipital area.

Some of these species vary considerably over their ranges, and other taxonomic treatments can be found. The discussion above generally follows Peters (1937) (except for '*risoria*') and Goodwin (1983), who along with Chappuis (1974) in particular, believed that vocalizations represent a critical factor in the speciation of this group. The two generally accepted subspecies of *S. decaocto* in addition to *S. d. decaocto* apparently consist of fairly small, remote populations: *S. d. stolickzae* in Chinese Turkestan, which is larger and paler than *decaocto;* and *S. d. xanthocyclus* in Burma, which is larger and much darker than *decaocto,* with a yellow ring of bare skin around the eye (Peters 1937, Vaurie 1961). *S. d. decaocto* occurs from India west to Europe, where it has undergone a remarkable explosion in population and range since 1930 (Fisher 1953, Cramp and Simmons 1985). It was also introduced into parts of eastern China and Japan before 1830 (Long 1981) and accidentally into the Bahamas about 1975 (pers. obs., Green 1977, *contra* Bond 1980 and A.O.U. 1983), where it is also expanding rapidly. The south Florida specimens were entirely typical of *S. decaocto* and showed no evidence of introgression due to prior hybridization with any other *Streptopelia* species, as might be expected if the population had strong avicultural roots. The probable origin of the birds in Florida is still under investigation. The results of the continuing research, along with more detailed notes on the identification and current American range of the Eurasian Collared-Dove, will be published subsequently.

Specimens HWK 393 and 391 have been given to the American Museum of Natural History and have been catalogued as AMNH 817191 and 817192, respectively. They are the first specimens of the Eurasian Collared-Dove collected in the United States.

We thank Allison Andors and Mary LeCroy of the Museum for their kind assistance and confirmation of the identity of the specimens secured in Florida. W. B. Robertson and Anthony White called our attention to important relevant papers, and Susan A. Dolder assisted with translations. This work was made possible in part by the Allen D. and Helen G. Cruickshank Award to Smith by the Florida Ornithological Society.

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Florida Field Naturalist 14: 104-107, 1986.

REPORT

FOS records committee report.—This is the second report of the Florida Ornithological Society Records Committee. It contains 47 records, of which 35 were accepted and 12 were not accepted because identification was not considered certain. These records include a few received by the Committee in 1982 and all those received in 1983 and 1984.

Committee members who served during this period or voted on some of the documents at a later date were Lyn Atherton, Oron Bass, Margaret Bowman, Robert Crawford, Lucy Duncan, Wally George, Wayne Hoffman, Larry Hopkins, Howard Langridge, Peggy Powell, and Henry Stevenson.

All sightings of rare birds in Florida should be submitted on the FOS Documentation Form to the current secretary of the Records Committee. Further information on Bylaws and the operations of the Records Committee may be found in the first report of the Committee (Bowman, 1983 Fla. Field Nat. 11: 42).

All records published thus far have been placed in a permanent file in the FOS Archives at the Florida State Museum in Gainesville, where they are available for research. Documents were submitted by: Lyn Atherton, Evelyn Barbig, Oron Bass, Robert Bradley, Michael Britten, Robin Carter, James Cavanagh, Ruth Cooper, Annette Cordano, Robert Crawford, William Dowling, Charles Duncan, Robert Duncan, Randall Evanson, Dave Goodwin, Gary Graves, Lise Hanners, William Hunter, Thomas Imhof, Fred Johnson, Kelton Jones, Howard Langridge, Gail Menk, Jeff Moore, Cathleen NeSmith, Bruce Neville, Stephen Patton, Peggy Powell, Tim Regan, Don Roberson, William Robertson, Ted Robinson, Tom Schooley, Betty Ann Smith, Marjorie Sokol, Bob Sokol, Annette Stedman, Stanley Stedman, Henry Stevenson, Doug Stuckey, Paul Sykes, Philip Tetlow, Clem Titzck, Tadziu Trotsky.—**Peggy Powell,** 2965 Forest Circle, Jacksonville, Florida 32217.

FOS Records Committee Report—1986

Number	Date Received	Species	Date Observed	Location (County)	Decision
82-021	10/25/82	Black-headed Gull[1]	08/08-21/82	Leon County Sewage Plant	Accepted
82-022	10/27/82	Golden-fronted Woodpecker	11/21/81	E. Pensacola Hghts (Escambia)	Accepted
82-023	10/29/82	Bahama Woodstar	07/17-08/06 /81	Homestead (Dade)	Accepted
82-024	12/07/82	South Polar Skua	09/05/82	Cape Canaveral offshore (Brevard)	Accepted
82-025	12/08/82	Kirtland's Warbler	04/29/82	Hypoluxo Island (Palm Beach)	Accepted
82-026	12/14/82	Rough-legged Hawk	11/10/82	Casey Key (Sarasota)	Not accepted
83-027	01/01/83	Thick-billed Murre	12/30/82	Casey Key (Sarasota)	Not accepted
83-028	01/06/83	LaSagra's Fly-catcher	12/21/82 01/24/83	Elliott Key (Dade)	Accepted
83-029	01/07/83	Townsend's Warbler	09/15/82	Dry Tortugas (Monroe)	Accepted
83-030	01/10/83	South Polar Skua	11/12/82	Lake Worth pier (Palm Beach)	Not accepted
83-031	01/11/83	Baird's Sandpiper[1]	09/05-13/82	Longboat Key (Manatee)	Accepted
83-032	01/13/83	Western Gull	09/17-20/82	Ft. Morgan, AL (Baldwin)	Not accepted
83-034	01/21/83	Brown Booby	01/17/83	Lake Okeechobee (Hendry)	Accepted
83-035	01/22/83	Zenaida Dove	10/10/81	Hypoluxo Island (Palm Beach)	Not accepted
83-036	01/30/83	Buff-bellied Hummingbird	11/25,30/82	Santa Rosa county	Accepted
83-037	02/28/83	Tree Sparrow	02/24/83	Titusville (Brevard)	Not accepted
83-038	03/05/83	Rock Wren[1]	11/27/82-02/10/83	St. George Island (Franklin)	Accepted
83-039	03/27/83	Fork-tailed Flycatcher	05/05/81	Big Cypress N.P. (Collier)	Accepted
83-040	03/28/83	California Gull	02/21/83	Toytown Landfill (Pinellas)	Accepted
83-041	04/13/83	Olivaceous Cormorant[1]	03/03/83	near 7 Mile Bridge (Monroe)	Not accepted
83-043	05/02/83	Stripe-headed Tanager	04/29/83	Cape Florida S. Rec. Area (Dade)	Accepted
83-045	07/06/83	Masked Duck	07/06,07/83	Okeelanta Sugar (Palm Beach)	Accepted
83-046	09/14/83	Bahama Swallow	08/16,19/83	Stock Is., Key (West (Monroe)	Accepted

83-047	09/15/83	Townsend's Warbler[1]	09/13,14/93	Ft. DeSoto S.P. (Pinellas)	Accepted
83-048	—	Arctic Loon[1]	03/05,14/83	Gulf Breeze (Santa Rosa)	Accepted
83-049	—	Band-rumped Storm Petrel	07/25/82	off Boynton Inlet (Palm Beach)	Accepted
83-050	11/24/83	Black-chinned Hummingbird[1]	01/12/83	Tallahassee (Leon)	Accepted
83-051	06/06/83	Ash-throated Flycatcher	04/12/83	St. George Island (Franklin)	Accepted
83-052	06/06/83	Lesser Nighthawk	04/26/83	St. George Island (Franklin)	Accepted
83-053	06/30/83	Long-tailed Jaeger	05/14/83	off Daytona Beach (Volusia)	Not accepted
83-054	01/10/84	Sabine's Gull	08/31/83	off Cape Canaveral (Brevard)	Accepted
83-055	01/25/84	Hudsonian Godwit	09/16,18/83	Zellwood (Lake)	Accepted
83-056	01/08/84	South Polar Skua	09/17/83	off Clearwater (Pinellas)	Not accepted
83-057	10/30/83	Lucy's Warbler	09/22/83	St. George Island (Franklin)	Not accepted
83-058	10/22/83	Stripe-headed Tanager	10/17/83	Cape Florida Rec. Area (Dade)	Accepted
84-059	02/02/84	Ferruginous Hawk	12/19/83-02/16/84	Zellwood (Lake)	Accepted
84-060	02/02/84	Arctic Loon	12/26/83	Ward's Bank (Duval)	Accepted
84-061	01/14/84	Bahama Mocking-bird	01/03/84	Port Canaveral (Brevard)	Not accepted
84-062	04/28/84	White-crowned Sparrow (*gambelli* race)[1]	04/05-18/84	Casey Key (Sarasota)	Accepted
84-063	05/11/84	Caribbean Elaenia[1]	04/28/84	Ft. Pickens S. P. (Escambia)	Accepted
84-064	05/30/84	(Yellow-green) Red-eyed Vireo	05/25/84	Hypoluxo Island (Palm Beach)	Accepted
84-065	07/17/84	Curlew Sandpiper[1]	12/26/82	Ft. Myers Beach (Lee)	Accepted
84-066	08/09/84	breeding Virginia Rail[1]	06/15/84	Hickory Mound Im. (Taylor)	Accepted
84-067	07/10/84	Bar-tailed Godwit	04/23/83	Turkey Point (Franklin)	Accepted
84-068	10/05/84	Fork-tailed Flycatcher	09/15/84	Everglades N. P. (Dade)	Accepted
84-069	10/05/84	Black-shouldered Kite	09/30/84	Weston Road (Broward)	Accepted
84-070	12/20/84	Snow Bunting	12/23/73-02/25/74	Venice (Sarasota)	Not accepted

[1]Documentation includes photograph(s).

REVIEWS

Birds of the Cayman Islands.—Patricia Bradley. 1985. Publ. by author, Georgetown, Grand Cayman. 245 pp., 72 color plates (by Yves-Jacques Rey-Millet), 7 maps. £22 ($32.50) plus £1.50 postage and packing. (Available from Law Reports International, Trinity College, Oxford OX1 3BH, England. Also available from The Crow's Nest Book Store, Laboratory of Ornithology, Cornell University, Ithaca, N.Y. 14850, for $25.95 plus $2.75 for mailing).—This book is the first field guide to the 177 species of birds recorded from the diminutive Caribbean islands of Grand Cayman, Little Cayman, and Cayman Brac (total land area 263 km^2). Ms. Bradley, a resident of Grand Cayman and active birder, is well familiar with the islands and their avifauna. The scope of her book includes the breeding birds, extinct forms, winter residents, transients, and all rare, casual, and accidental species for which there are reliable records.

The book is a pocket-sized guide, with a glossy hard cover and a sturdy binding. The Duke of Edinburgh, has provided a Foreword, and Dr. Oscar T. Owre, the Preface. The author's 19 page Introduction contains interesting and useful sections on physical characteristics of the Cayman Islands, derivation of the islands' avifauna, comments on breeding species, a checklist of the 16 endemic subspecies and the islands where they breed, and a discussion of non-breeding birds. In her section on Ecosystems and Habitat Zones, Ms. Bradley describes the dominant vegetation in the four ecological zones of the islands, gives a list of birds likely to be found in each zone, and includes birding sites for each zone on the three islands. The Introduction has a short section on conservation, in which Ms. Bradley describes the threats (particularly land development) to bird habitat in the Caymans and current efforts to set land aside as Bird Sanctuaries and to stop hunting of such species as the Cuban Parrot (*Amazona leucocephala*) and the locally rare Caribbean Dove (*Leptotila jamaicensis*). The introductory material concludes with a useful section on "Bird Identification and use of Text" and a glossary of terms used in the book.

The main body of the text consists of detailed accounts for each of the islands' 149 breeding, extinct, and migrant species, which are presented in taxonomic order by family. Scientific and English common names follow the Sixth Edition of the A.O.U. Check-list of North American Birds (1983), although there are inconsistences in the use of common English names (e.g., Parula Warbler = Northern Parula, American Brown Pelican = Brown Pelican). The Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), not the [Southern] Rough-winged Swallow (*Stelgidopteryx ruficollis*), occurs in the Caymans. Ms. Bradley also includes local English names, which are of great value for the visiting birder. Body size for each species is given in centimeters and inches. Plumage characteristics are given for adults and immatures and, where appropriate, for each sex or color morph. Characteristics of particularly diagnostic importance are presented in italics for quick reference. The range of the species outside the Caymans and habitat in the Cayman Islands are presented next for each species. The section on habits contains valuable information on clutch sizes, breeding chronology, and general behavior compiled from the author's observations and other sources. Each account concludes with a description of the species' status, including breeding status, island where the species occurs, and its seasonal abundance.

The book contains 67 color photographs of Cayman Island birds, a color photo of each of the 4 habitat zones, and an aerial photograph of Little Cayman Island, all by Yves-Jacques Rey-Millet. Each of the 45 breeding species is depicted in a color photograph; 25

species are illustrated with one plate each, whereas 20 other species are depicted in two or three plates and inserts. Besides the 36 species shown in adult plumages, nine species are illustrated with adult and immature or juvenile plumages; four species are depicted in male and female plumages; one species is shown in breeding and non-breeding plumages, and both color morphs of the Red-footed Booby (*Sula sula*) are shown. Illustrations of North American species are not included. Each of the plates is well indexed to the text account of that species, and vice versa.

Although photographs are not the best diagnostic illustrations for a field guide, the quality and utility of the plates included in this book mostly range from good to exquisite (Snowy Egret *Egretta thula*, flight shots of Brown Booby *Sula leucogaster*, and White-tailed Tropicbird *Phaethon lepturus*). The exceptions are the few photographs (e.g., Black-whiskered Vireo *Vireo altiloquus*, Yucatan Vireo *V. magister*) taken from behind and under the bird, rendering them of little value in field identification.

Ms. Bradley has included two appendices. Appendix I contains an annotated list of the 28 species she considers rare transients, casual, or accidental in the islands. This appendix also includes a checklist of breeding birds referenced to island, recommended field guides for the West Indies and North America (particularly useful for those species not illustrated in this book), and a selected bibliography, containing 17 books and 35 papers, 22 of which are on Cayman subjects. Appendix II contains sections on Birding Trips and "Phototips," maps of each of three islands, with details of three recommended birding sites on Grand Cayman, and a map of the northern Caribbean Sea, showing the location of the Cayman Islands.

The Index contains boldface subjects, italicized scientific names, and standard and local English names of birds.

Ms. Bradley's fine book is essential for anyone making a birding trip to the Cayman Islands. It is also valuable as a compilation of records and aspects of the biology of birds from these islands and for the many new data on the ecology of Cayman birds from the author's field work.

In keeping with her interest in Cayman Island bird conservation, Ms. Bradley is donating a portion of the profits from the book to the World Wildlife Fund.—**James W. Wiley,** Patuxent Wildlife Research Center, U.S. Fish and Wildlife Service, Apartado 21, Palmer, Puerto Rico 00721.

Florida Field Naturalist 14: 110-111, 1986.

EDITORIAL

Acknowledgments.—This concludes my fifth and final volume as editor of the Florida Field Naturalist. Although through these five years I have conscientiously avoided editorializing on these pages, I am compelled to take a last advantage of the position to acknowledge those who have helped me in this most pleasurable of assignments.

During my tenure I could do no better than to attempt to maintain the standards set by my predecessors Henry Stevenson and Fred Lohrer, who have kept themselves available for learned counsel. Fred Lohrer served two years as Associate Editor for reviews and has continued to produce his annual review of Florida birds in the periodical literature, and to watch over my shoulder.

A strength of this journal, as well as the society that sponsors it, is the interaction of professional and avocational ornithologists. The professional ornithologist members have always stood ready to provide advice and criticism, and two have been especially dependable counselors, Dr. Glen Woolfenden and Dr. Jack Hailman. They have been instrumental in helping me achieve whatever I might have during my tenure. Dr. Oscar Owre has served diligently as a member of the Editorial Advisory Board and as Associate Editor for reviews. Among our avocational ornithologists, the work of H. P. Langridge has been stellar. As Associate Editor for bird distribution, he has helped many of our first-time authors overcome the hurdles erected by technical style requirements. I hope more of our potential authors will consult with him. We intend the pages of the Florida Field Naturalist to be accessible to all our members, and Howard has helped that become easier. He has also corrected my grammar. I thank each of my Associate Editors for their help.

The Florida Field Naturalist is a fully refereed journal. We can be confident in the accuracy and pertinence of our articles because of the efforts of the guardians of our content, the voluntary referees who are imposed upon to review each submission. The criteria of accuracy they use are no different than would be applied to a journal having a national distribution. For the current volume, I thank Wilson Baker, Michael Callopy, Roger Clapp, James Cox, Robert Crawford, Wally George, Jack Hailman, John William Hardy, David Hirth, Wayne Hoffman, Larry Hopkins, Stephen Humphrey, Herbert Kale, H. P. Langridge, James Layne, Fred Lohrer, Doug McNair, Steve Nesbitt, John Ogden, Oscar Owre, Stephen Patton, Richard Paul, Peggy Powell, William Robertson, James Rodgers, Henry Stevenson, Milton Weller, and Glen Woolfenden. One might notice that nearly one-fifth of these reviewers were non-Floridians, indicating not only our desire to have the best advice possible but also the willingness of persons outside the state to provide guidance to our regional journal.

Publishing a scientific journal is not inexpensive, but many have helped us produce a professional product while minimizing costs to our members. Our institution of advertisement and page charges has generated important revenues. I would like to thank those agencies that have been especially generous in supporting their employees' publication in our journal, especially the Florida Game and Fresh Water Fish Commission, US Fish and Wildlife Service, and Archbold Biological Station. I also thank individual authors whose donations helped defray costs of publication. Mr. Robert Manns has shown his confidence by advertising in our journal, and I encourage our readers to patronize his extremely knowledgable optical services. I especially wish to acknowledge the treasurer of our society, Caroline Coleman, whose guidance has maintained our solvancy, and our printer E. O. Painter. I thank Don Johnston and Dick Johnston of E. O. Painter for their guidance and attention to detail. The society is fortunate to be working with such fine professionals.

James Rodgers has served well as Associate Editor for technical papers, in which job he has helped authors put their biological and behavioral observations into technical style. As he moves to the editor's job, I thank him for his continued committment to the future of our journal and look forward to seeing his own innovations.

Perhaps the person most influential in shaping my tenure as editor was Dr. Oliver Austin, honorary member of the Florida Ornithological Society. When in doubt my standard always was to guess what Dr. Austin might have done.

I also thank the officers and members of the society whose support for the journal has been unequivocal. Ted Below, Bobbie Kittleson, and Bob Brown supplied important leadership in maintaining journal quality. The members of the Florida Ornithological Society have been consistently supportive of our efforts. Most of all I thank the authors who have shared with us their exciting observations and discoveries. An editor is no more than an ephemeral conduit between the authors and the readers, who are the heart and soul of our journal and the society. Thank you all.—**James A. Kushlan,** Department of Biological Sciences, East Texas State University, Commerce Texas 75428.

Florida Field Naturalist 14: 111-112, 1986.

Florida Field Naturalist

ISSN 0738-999x

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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The Florida Field Naturalist is a fully refereed journal emphasizing biological field studies and observations of vertebrates, especially birds, in and near Florida and the nearby West Indies. It welcomes submission of manuscripts containing new information from these areas. Please consult recent issues for style, and Vol. 14, No. 1 for detailed information. Submit manuscripts for consideration to the editor James A. Rodgers. Monograph-length manuscripts may be submitted for consideration to the Editor of Special Publications John William Hardy. Send books and other materials for review to Associate Editor Oscar T. Owre. Send copies of recent literature on Florida birds to Special Editor Fred E. Lohrer. For preliminary assistance regarding submission of manuscripts dealing with bird distribution and rarities contact Associate Editor Howard P. Langridge. Reports of rare birds in Florida should also be submitted to the FOS Records Committee Secretary Peggy Powell. For preliminary assistance regarding submission of scientific, technical, or behavioral contributions contact Associate Editor Richard T. Paul

Florida Field Naturalist

PUBLISHED BY THE FLORIDA ORNITHOLOGICAL SOCIETY

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